Final Submittal

Energy Engineering Analysis Program
Lighting Survey of Selected Buildings
Pine Bluff Arsenal

Pine Bluff, Arkansas

Volume IV
Programming Documents

Contract No. DACA01-94-D-0038
Delivery Order No. 0001

June 1995

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FINAL SUBMITTAL

ENERGY ENGINEERING ANALYSIS PROGRAM

LIGHTING SURVEY OF SELECTED BUILDINGS

PINE BLUFF ARSENAL

PINE BLUFF, ARKANSAS

VOLUME IV

PROGRAMMING DOCUMENTS

CONTRACT NO. DACA01-94-D-0038
DELIVERY ORDER NO. 0001

PREPARED FOR:

U.S. ARMY CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

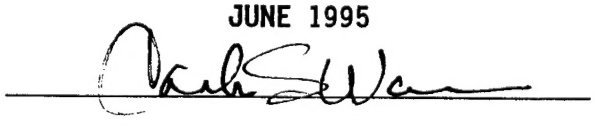
PREPARED BY:

REYNOLDS, SMITH AND HILLS, INC.
ENERGY SERVICES DEPARTMENT
P.O. BOX 4850
JACKSONVILLE, FLORIDA 32201

PROJECT NO. 6941331001

19971017 256

JUNE 1995



Carlos S. Warren, PhD, PE
Project Manager

VOLUME VI
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DTIC QUALITY INSPECTED 3

FORM 1391

96 45976 M REVISION DATE: 07 APR 1995
ARMY MR (AS OF 04/07/1995 AT 14:54:53) 06 APR 1995
LAF=.78

Pine Bluff Arsenal
Arkansas

MAINT, REP
LIGHTING SYSTEMS (FEMP)

800 00 45976 370

PRIMARY FACILITY				315
Upgrade/Replace Lighting	LS	--	--	(299)
Install Occupancy Sensors	LS	--	--	(13)
LED Exit Signs	LS	--	--	(3)

SUPPORTING FACILITIES

ESTIMATED CONTRACT COST	315
CONTINGENCY PERCENT (10.0%)	32
SUBTOTAL	347
SUPERVISION, INSPECT & OVHD (6.00%)	21
TOTAL REQUEST	368
TOTAL REQUEST (ROUNDED)	370
ASSOCIATED CONSTRUCTION COST	(0)

Lighting. Remove unneeded lamps or fixtures. Reduce indoor lighting. Lower light fixtures. Replace incandescent lamps with compact fluorescent lamps. Replace standard fluorescent lamps with energy conserving lamps. Replace standard fluorescent ballasts with electronic ballasts. Replace flourescent fixtures with fixtures having efficient reflectors, electronic ballasts and energy-saving lamps. Upgrade lighting from incandescent to fluorescent, fluorescent to HID and mercury vapor to high pressure sodium, etc. Sensors. Install occupancy sensors. Signs. Replace incandescent exit sign fixtures with LED fixtures. Replace incandescent lamps in exit signs with compact fluoresent lamps.

11. REMT: 45 SA ADDT: NONE SUBSTNDRD: 45 SA

PROJECT JUSTIFICATION:
This project is required to install replacement lighting systems and controls--includes new fixtures, lamps, ballasts and sensors.

FOR OFFICIAL USE ONLY

PROTECTIVE MARKINGS CANCELLED
UPON BID OPENING

96 45976 W REVISION DATE: 07 APR 1995
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Pine Bluff Arsenal
Arkansas

MAINT. REP
LIGHTING SYSTEMS (FEMP) 45976

PROJECT JUSTIFICATION: (Continued)
Fixtures (843) will be removed, and 641 installed. The installed fixtures are various energy-efficient types, and include compact fluorescent replacement of incandescent lamps. All new fixtures employ T8 technology.

Fixtures (3,109) will be changed (upgraded); 8,776 lamps and 4,475 ballasts removed, and 6,464 T8 lamps and 3,109 electronic ballasts installed; 270 reflectors are also installed in existing fixtures.

Occupancy sensors in restrooms and breakrooms will be installed. Exit sign retrofit using low cost LED lamps will be provided for 55 signs.

ADDITIONAL INFORMATION:
Illuminance levels to be brought into line with AEI recommendations shown in Table 3-1. In many cases, present levels are too high.

T8 lamps and electronic ballasts would replace existing T12 lamps and electromagnetic ballasts, including energy-saving lamps and ballasts already in place. The T12 and electromagnetic-technologies would be phased out and the T8 technology adopted installation wide.

Existing fixtures would be used where possible. If illuminance levels were reduced, lamps would be removed, reflectors would be installed if necessary to meet AEI footcandle (FC) recommendations. Fixtures would be moved if practical and necessary.

Higher-efficiency fixtures would replace low-efficiency fixtures where practical.

Compact fluorescent lamps would replace incandescent lamps where practical. Exceptions were made for fixtures with low utilization (e.g., janitors' closets).

Excessive fixtures would be removed where necessary.

The site survey revealed that lights were on in many unoccupied areas.

Most existing exit signs contain two, 15-watt incandescent lamps.

The ECIP life cycle cost analysis indicates the cost effectiveness of this project. The result shows a savings-to-investment ratio

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Pine Bluff Arsenal
Arkansas

MAINT, REP
LIGHTING SYSTEMS (FEMP) 45976

ADDITIONAL INFORMATION: (Continued)
(SIR) of 2.0 and simple payback of 5.9 years.

IMPACT IF NOT PROVIDED:
If this project is not approved, the continued energy waste of 3,135 MBTU/YR (92 KWH/YR) with $63,108 annual cost will result. This is contrary to national goals.

ASSOCIATED PROJECT SCOPE:
Illuminance levels were to be brought into line with AEI recommenations shown in Table 3-1. In many cases, present levels are too high.

T8 lamps and electronic ballasts would replace existing T12 lamps and electromagnetic ballasts, including energy-saving lamps and ballasts already in place. The T12 and electromagnetic-technologies should be phased out and the T8 technology adopted installationwide.

Existing fixtures would be used where possible. If illuminance levels if necessary to meet AEI footcandle (FC) recommendations. Fixtures would be moved if practical and necessary.

Higher-efficiency fixtures would replace low-efficiency fixtures were practical.

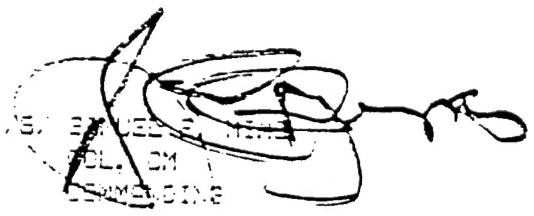
Compact fluorescent lamps would replace incandescent lamps where practical. Exceptions were made for fixtures with low utilization (e.g., janitors' closets).

Excessive fixtures would be removed where necessary.

The site survey revealed that lights were on in many unoccupied areas.

Most existing exit signs contain two. 5-watt incandescant lamps.

The ECIP life cycle cost analysis indicates the cost effectiveness of this project. The result shows a savings-to-investment ratio (SIR) of 2.0 and simple payoack of 5.9 years



96 45975 W REVISION DATE: 07 APR 1995

ARMY MR (AS OF 04/07/1995 AT 14:54:52) 06 APR 1995

LAF= .78

Pine Bluff Arsenal
Arkansas

MAINT, REP
LIGHTING SYSTEMS (FEMP) 45975

ESTIMATED CONSTRUCTION START:	MAR 1996	INDEX: 2000
ESTIMATED MIDPOINT OF CONSTRUCTION:	SEP 1996	INDEX: 2032
ESTIMATED CONSTRUCTION COMPLETION:	MAR 1997	INDEX: 2060

Pine Bluff Arsenal
Arkansas

MAINT, REP
LIGHTING SYSTEMS (FEMP)

			U/M	Qty	45976 Unit Cost	Cost ($000)
2.A PRIMARY FACILITY.						
2.A1 GENERAL.						
1.0)	80000	Upgrade/Replace Ligh	LS	--	--	(299)
2.0)	80000	Install Occupancy Se	LS	--	--	(13)
3.0)	80000	LED Exit Signs	LS	--	--	(3)

1996 45976 W REVISION DATE: 07 APR 1995
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DATE 06 APR 1995 FY 96 PROGRAM
PROJECT NUMBER: 45976
PROJECT TITLE: LIGHTING SYSTEMS (FEMP)
INSTALLATION: Pine Bluff Arsenal
LOCATION: Arkansas

QUANTITATIVE DATA

(U/M EA)

A.	TOTAL REQUIREMENT	45	
B.	EXISTING SUBSTANDARD	45	
C.	EXISTING ADEQUATE		
D.	FUNDED, NOT INVENTORY		
E.	ADEQUATE ASSETS		
//		AUTHORIZED	FUNDED
H.	DEFICIENCY (A-E)	45	45

1996 45976 W REVISION DATE: 07 APR 1995
MR (AS OF 04/07/1995 AT 14:54:52) 06 APR 1995
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DATE 06 APR 1995 FY 96 PROGRAM
PROJECT NUMBER: 45976
PROJECT TITLE: LIGHTING SYSTEMS (FEMP)
INSTALLATION: Pine Bluff Arsenal
LOCATION: Arkansas

SECTION 11 - ECONOMIC ANALYSIS DATA

11D DECISION ANALYSIS

a. The Life Cycle Cost Analysis Summary results are summarized as follows:

Annual Energy Savings (MBtu/year)	
Electricity	3,135
Annual Energy Cost Savings ($/year)	$63,108
SIR	2.0
Simple Payback (years)	5.9

b. See Life Cycle Cost Analysis Summary in following SECTION 11E.

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DATE 06 APR 1995 FY 96 PROGRAM
PROJECT NUMBER: 45976
PROJECT TITLE: LIGHTING SYSTEMS (FEMP)
INSTALLATION: Pine Bluff Arsenal
LOCATION: Arkansas

PINE BLUFF ARSENAL -----VALIDATED
CONTROL NO. 95-12 LEVE
PHONE: DSN 966-3756 DATE:
VALIDATOR: APPROVE:
VOID AFTER: 12 Apr 96
-----CECDC: P3A

11E ECONOMIC ANALYSIS

LIFE CYCLE COST ANALYSIS SUMMARY STUDY: PBA01
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP) LCCID FY95 (92)
INSTALLATION & LOCATION: PINE BLUFF ARS REGION NOS. 6 CENSUS: 3
PROJECT NO. & TITLE: PN 45976, LIGHTING SYSTEMS (FEMP)
FISCAL YEAR 96 DISCRETE PORTION NAME: TOTAL
ANALYSIS DATE: 03-27-95 ECONOMIC LIFE 15 YEARS PREPARED BY: C. WARREN

1. INVESTMENT

A. CONSTRUCTION COST	$ 330558.		
B. SIOH	$ 19834.		
C. DESIGN COST	$ 19834.		
D. TOTAL COST (1A+1B+1C)	$ 370226.		
E. SALVAGE VALUE OF EXISTING EQUIPMENT		$ 0.	
F. PUBLIC UTILITY COMPANY REBATE		$ 0.	
G. TOTAL INVESTMENT (1D - 1E - 1F)			$ 370225.

2. ENERGY SAVINGS (+) / COST (-)
DATE OF NISTIR 85-3273-X USED FOR DISCOUNT FACTORS OCT 1994

FUEL	UNIT COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	$ 20.13	3135.	$ 63108.	12.02	$ 758553.
B. DIST	$ .00	0.	$ 0.	14.23	$ 0.
C. RESID	$ .00	0.	$ 0.	15.87	$ 0.
D. NAT G	$ .00	0.	$ 0.	14.17	$ 0.
E. COAL	$ .00	0.	$ 0.	13.28	$ 0.
F. PPG	$ .00	0.	$ 0.	13.49	$ 0.
M. DEMAND SAVINGS			$ 0.	11.94	$ 0.
N. TOTAL		3135.	$ 63108.		$ 758553.

NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-) $ -233.
(1) DISCOUNT FACTOR (TABLE A) 11.94
(2) DISCOUNTED SAVING/COST (3A X 3A1) $ -2782.

B. NON RECURRING SAVINGS(+) / COSTS(-)

ITEM	SAVINGS(+) COST(-) (1)	YR OC (2)	DISCNT FACTR 93)	DISCOUNTED SAVINGS(+)/ COST(-)(4)
d. TOTAL	$ 0.			0.

1996 45976 W REVISION DATE: 07 APR 1995
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LAF=.78

DATE 06 APR 1995 FY 96 PROGRAM
PROJECT NUMBER: 45976
PROJECT TITLE: LIGHTING SYSTEMS (FEMP)
INSTALLATION: Pine Bluff Arsenal
LOCATION: Arkansas

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-)(3A2+3Bd4) $ -2782.

4. FIRST YEAR DOLLAR SAVINGS 2N3+3A+(3Bd1/(YRS ECONOMIC LIFE)) $ 62875.

5. SIMPLE PAYBACK PERIOD (1G/4) 5.89 YEARS

6. TOTAL NET DISCOUNTED SAVINGS (2N5+3C) $ 755771.

7. SAVINGS TO INVESTMENT RATIO (SIR)=(6 / 1G)= 2.04
(1IF (1 PROJECT DOES NOT QUALIFY)

DETAILED PROJECT JUSTIFICATION

1. General:

The proposed project will reduce energy consumption at Pine Bluff Arsenal by increasing the efficiency of the fluorescent lighting systems, by reducing the lighting levels in over-lighted areas, by utilizing lower-wattage exit signs, and by allowing lighting to be turned off automatically in many areas. The result is that less energy will be required to provide lighting.

2. Accommodations Now in Use:

Forty-five permanent structures.

3. Analysis of Deficiency:

The fluorescent lighting at Pine Bluff Arsenal uses standard lamps and ballasts. Implementing this project will improve the efficiency of the lighting systems. Lights are often left on in restrooms and breakrooms. Occupancy sensors will solve these problems. Exit signs that use incandescent lamps will be retrofitted with low-wattage LEDs.

4. Consideration of Alternatives:

Alternatives were considered and evaluated. The most cost-effective solutions were recommended.

5. Criteria for Proposed Construction:

The proposed project will conform with all federal and U.S. Army regulations.

6. Program for Related Furnishings and Equipment:

No furnishings or equipment funded from appropriations other than MCA are required.

7. Disposal of Present Assets:

No buildings will be disposed.

8. Survival Measures:

This project is not suitable for inclusion for protective shelter.

9. Summary of Environmental Consequences:

Ballasts may contain PCBs and should be properly disposed.

10. Evaluation of Flood Hazards and Encroachment on Wetlands:

These facilities are not located in a flood plain and do not encroach on wetlands.

11. Economic Justification

The ECIP Economic Analysis Summary is attached.

12. Utility and Telecommunications Support

No related utility support is programmed. The existing utility systems are adequate.

No telecommunications support is required. Coordination has been made between the DEH and USACC as authenticated by:

_____ _____

Date

13. Protection of Historic Places and Archeological Sites

Review procedures have been implemented for this project in accordance with 36 CFR Part 800, "Procedures for the Protection of Historic and Cultural Properties." The review has established that there will be no adverse effect.

14. Project Development Brochure

A PDB is provided in a separate document.

15. Energy Requirements

An Energy Requirements Appraisal has been prepared for this project and is attached (ERA in SRP-3).

16. Provisions for the Handicapped

No provisions for the handicapped will be made since the scope of this project is in o way applicable to designing for the handicapped.

17. Real Property Maintenance Activity (RPMA)

No additional RPMA will be required.

18. Commercial Activities

This project has been reviewed considering the requirements of commercial and industrial type facilities, and it has been determined that whereas this project does not affect commercial facilities, those requirements do not apply.

SRP-3, ENERGY REQUIREMENT APPRAISAL

1. Project Description:

   a. Installation: Pine Bluff Arsenal

   b. Project No.: 45976

   c. Project Title: High Efficiency Lighting

   d. Geographical Location: Pine Bluff, Arkansas

   e. Physical Description: Replacement of standard fluorescent lamps and ballasts with high efficiency types, installation of occupancy sensors, installation of LED exit signs, installation of reflectors in fixtures, removal of excess fixtures.

2. Estimated Energy Consumption:

   It is estimated that the proposed system will result in a new decrease in energy consumption of 3135 MBtu/yr.

3. Energy Sources:

   No additional energy sources will be required as a result of implementing this project.

4. Energy Use Impacts:

   All the existing utility systems will support the energy requirements without system expansion.

5. Energy Conservation:

   It is estimated that the proposed system will result in a net decrease in energy consumption of 3015 MBtu/yr.

6. Energy Alternatives:

   An investigation revealed that no energy alternatives exist which might reduce total demand or reduce loading on critical energy sources.

7. Energy Effects:

   No adverse environmental effects are anticipated. Degradation of environmental standards will not allow the use of more efficient energy sources.

8. Basis of Appraisal:

   In consideration of energy sources and energy requirements, total energy and selective energy have been considered and disregarded as inapplicable.

installation: Pine Bluff Arsenal

project: High Efficiency Lighting (ECIP)

project number
temporary: 45976 program year FY96

permanent: 45976 category code 80000

point of contact:

user
name Nancy Rimmer date 5 June 1995

title Energy Coordinator phone (501) 540-3312

autovon

dfae
name date

title phone

autovon

engineer district
name Mark Emmerling date 5 June 1995

title Electrical Engineer phone (501) 324-6905

autovon

other (A-E)
name Dr. Carlos S. Warren, PE date 5 June 1995

title Project Manager phone (904) 279-2275

autovon

reviewed by:

installation facility engineer
name date

title phone

autovon

approved by:

macom engineer
name date

title phone

autovon

project development brochure, PDB-1

DA FORM 5020-R, Feb 82

facility

BUILDINGS:

10020, 10030, 10050, 13010, 13020, 13030, 13040, 13060, 13080
13100, 13110, 16210, 16220, 31010, 31080, 32030, 32035, 32060
32070, 32090, 32100, 32130, 32150, 33060, 33530, 34110, 34120
34140, 34910, 34970, 44100, 51420, 51430, 53160, 60020, 60060
60070, 60090, 60630, 63100, 63110, 63120, 63200, 63210, 63410

project coordinator for using service

NANCY RIMMER
(501) 540-3312

OBJECTIVE

This project is required to meet stated goals of energy use reduction pursuant to Executive Orders 12003, 12759 and 12902. It is submitted as part of the Energy Conservation Investment Program (ECIP).

The objective of this project is to improve the efficiency and utilization of the fluorescent lighting systems in 45 buildings at Pine Bluff Arsenal, to replace incandescent lamps with fluorescent lamps where necessary, to install occupancy sensors to turn off lights in unoccupied restrooms and breakrooms, and to retrofit incandescent exit signs with light-emitting-diodes (LEDs). Measures included removal of and replacement of inefficient fixtures, removal of lamps in fixtures, replacement of T12 lamps with T8 lamps, replacement of electromagnetic ballasts with electronic ballasts, and installation of reflectors in some fixtures.

Implementation of this project will save approximately 3,315 MBtu of electricity each year which currently costs $63,108 annually. The SIR is 2.0 and the payback is 5.9 years. Approximately $2,600 in annual air-conditioning costs will also be saved.

LIST OF OCCUPANTS

Occupants of the 45 buildings are administrative, operations, and support personnel. Numbers of occupants in each facility vary, based on mission.

SPACE AND REQUIREMENTS

N/A

SUMMARY OF FUTURE CHANGES AND IMPACTS

N/A

A. SPECIAL CONSIDERATIONS

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
A-1	Cost estimates for each primary and supporting facility	R		X	
A-2	Telecommunications system coordination with USACC and authorization for exceptions	NR			
A-3	Coordination with state and local governmental requirements (blind vendors, medical facilities, construction and operating permits, clearinghouse coordination, etc.)	R	C		
A-4	Assignment of airspace	NR			
A-5	Economic analysis of alternatives	R		X	
A-6	Approval for new starts	R	A		
A-7	International balance of payments (IBOP) coordination with U.S. European command and NATO-overseas cost estimates and comparables (include rate of exchange used in estimates)	NR			
A-8	Impact on historic places–on site survey by authorized archeologist and coordination with state historic preservation officer and advisory council on historic preservation	NR			
A-9	Exceptions to established criteria	NR			
A-10	Physical Security Analysis and Threat Statement prepared by Provost Marshal/Physical Security Officer	NR			
A-11	Coordination with other various user staff agencies (G/S-2 Intelligence Personnel)	NR			
A-12	Identification of related or support projects (so projects can be coordinated)	NR			
A-13	Required completion date	R	A		
	Other Special Considerations (list and number items)				

REQUIRED OR NOT REQUIRED – Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED – Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED – Significant information summarized or explained and attached.

DOCUMENT ATTACHED – Significant information is in an existing document which is attached

*BY WHOM (Check and insert appropriate letter)

A – DFAE
B – Using Service
C – Construction Service
D – Designer
E – Other (Check Comments Attached and explain)

documentation checklist

4

DA FORM 5023-A-R, Jan 87 EDITION OF FEB 82 IS OBSOLETE.

COMMENTS

DOCUMENTATION CHECKLIST

ITEM	COMMENT
A-1	Cost estimates are part of the 1391 package.
A-5	Economic analysis of alternatives are included in 1391 package and Pine Bluff Arsenal Lighting Survey Report (June, 1995).

C. ARCHITECTURAL & STRUCTURAL

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
C-1	Reconciliation with troop housing programs and requirements	NR			
C-2	Evaluation of existing facilities (including degree of utilization)	NR			
C-3	Approval for removal and relocation of existing useable facilities	NR			
C-4	Evaluation of off-post community facilities	NR			
C-5	Storage and maintenance facilities (including nuclear weapons)	NR			
C-6	Coordination hospitals, medical and dental facilities with Surgeon General	NR			
C-7	Coordination of aviation facilities with FAA	NR			
C-8	Coordination air traffic control and navigational aids with USACC	NR			
C-9	Tabulation of types and numbers of aircraft	NR			
C-10	Evaluation of laboratory, research and development, and technical maintenance facilities	NR			
C-11	Coordination chapels with Chief of Chaplains	NR			
C-12	Review food service facilities by USATSA	NR			
C-13	Automated data processing system or equipment approvals—cost analysis when ADP and/or communication centers not co-located with related facilities	NR			
C-14	Coordination postal facilities with U.S. Postal Service Regional Director	NR			
C-15	Laundry and dry cleaning facilities coordination with ASD(I&L)	NR			
C-16	Tenant facilities coordination with installation where sited	NR			
C-17	Facilities for or exposed to explosions, toxic chemicals, or ammunition—review by DDESB (See also Item B-4)	NR			
C-18	Analysis of deficiencies	NR			
C-19	Consideration of alternatives	NR			
C-20	Determination whether occupants will include physically handicapped or disabled persons	NR			
C-21	As-build drawings for alterations or additions	R	A		
C-22	Availability of Standard Design or site adaptable designs	NR			
C-23	Evaluation of facilities with Provost Marshal/Physical Security Officer (Installation Terrorist Threat Assessment)	NR			
	Other Architectural and Structural (list and number items)				

REQUIRED OR NOT REQUIRED – Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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E – Other (Check Comments Attached and explain)

documentation checklist

6

DA FORM 5023-C-R, Jan 87 EDITION OF FEB 82 IS OBSOLETE.

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
D-1	Fuel considerations and cost comparison analysis	NR			
D-2	Energy requirements appraisal (ERA)	R		X	
D-3	Conformance with DOD Energy Reduction requirements	R		X	
D-4	Evaluation of existing and/or proposed utility systems	NR			
D-5	Evaluation of systems with Provost Marshal/Physical Security (Installation Terrorist Threat Assessment)	NR			
	Other Mechanical and Utility Systems (list and number items)				

REQUIRED OR NOT REQUIRED – Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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COMMENT ATTACHED – Significant information summarized or explained and attached.

DOCUMENT ATTACHED – Significant information is in an existing document which is attached

*BY WHOM (Check and insert appropriate letter)

A – DFAE
B – Using Service
C – Construction Service
D – Designer
E – Other (Check Comments Attached and explain)

documentation checklist

DA FORM 5023-D-R, Jan 87 EDITION OF FEB 82 IS OBSOLETE.

COMMENTS

DOCUMENTATION CHECKLIST

ITEM	COMMENT
D-2	ERA is part of 1391 package.
D-3	Project will reduce energy use at Pine Bluff Arsenal.

E. ENVIRONMENTAL CONSIDERATIONS

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
E-1	Environmental impact assessment	NR			
E-2	EIA conclusions require Environmental Impact Statement	NR			
E-3	Determination of health, environmental or related hazards. Assistance to determine existence of any health, environmental or related hazard may be requested from Aberdeen Proving Ground, MD 21010, the Office of the Surgeon General, Attn: DASG-HCH (Army Environmental Hygiene Agency)	NR			
E-4	Air/water pollution permit, coordination with agencies and compliance with standards at Federal, state and local level	NR			
E-5	Corrective measures associated with Environmental Impact Statements or assessment—list separately and evaluate.	NR			
	Other environmental considerations (list and number items)				
E-6	Solid waste disposal criteria	R	C	X	

REQUIRED OR NOT REQUIRED – Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED – Information needed but not currently available. Enter code for information source.

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A – DFAE
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C – Construction Service
D – Designer
E – Other (Check Comments Attached and explain)

documentation checklist

DA FORM 5023-E-R, Feb 82

COMMENTS

DOCUMENTATION CHECKLIST

ITEM	COMMENT
E-6	Standard ballasts to be removed may contain PCBs, especially if manufactured before 1978. To meet federal hazardous waste disposal requirements, PCB-containing ballasts must be sealed in EPA-approved drums and either sent to approved storage sites or incinerated.

A. SPECIAL CONSIDERATIONS

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
A-1	Factors of risk, restriction or unusual circumstance expected to increase costs beyond applicable area averages	NR			
A-2	Construction phasing requirements	R	A,B		
A-3	Functional support equipment (mechanical, electrical, structural, and security) to be built in	NR			
A-4	Equipment in place and justification	NR			
A-5	Other equipment and furniture (O&MA, OPA) and costs	NR			
A-6	Special studies and tests (hazards analyses, compatibility testing, new technology testing, etc.)	NR			
A-7	Type of construction (permanent, temporary, semi-permanent)	NR			
A-8	Government furnished equipment (quantities, procurement time, availability and special handling and storage requirements). Funds used for procurement.	NR			
	Other special considerations (list and number items)				

REQUIRED OR NOT REQUIRED – Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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A – DFAE

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D – Designer

E – Other (Check Comments Attached and explain)

technical data checklist

11

DA FORM 5024-A-R, Feb 82

B. SITE DEVELOPMENT

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
B-1	Construction restrictions or guidelines pertaining to				
(A)	site access and preferred construction routes	NR			
(B)	Airfield clearance, explosive storage, working hours, safety, etc.	NR			
(C)	Facilities and/or functions or adjoining areas (structures, materials, impact)	NR			
B-2	Real estate actions (acquisition, disposal, lease, right-of-way)	NR			
B-3	Demolition/relocation required (data)				
(A)	Special considerations due to explosives/radioactivity/ chemical contamination/asbestos emissions/toxic gases	R	A,B		
(B)	Restrictions on disposal of demolished/relocated material including hazardous waste	NR			
B-4	Pavement types and requirements (including traffic surveys and MTMC coordination)	NR			
B-5	Landscape considerations				
(A)	Protection of existing vegetation	NR			
(B)	Stockpile topsoil	NR			
	Other Site Development (List and number items)				

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technical data checklist

DA FORM 5024-B-R, Feb 82

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
D-1	Special mechanical requirements or considerations (elevator, crane, hoist, etc.)	NR			
D-2	Special peak usage periods and peak leveling techniques	NR			
D-3	Maintenance considerations (accessibility of equipment, compatibility with existing equipment)	NR			
D-4	Plumbing—availability, general system type and characteristics (proposed and/or existing, incl. compressed air and gas)	NR			
D-5	Heating—availability, general system type and characteristics (proposed and/or existing)	NR			
D-6	Ventilating, air condition/refrigeration—availability, general system type and characteristics (proposed and/or existing)	NR			
D-7	Electrical—availability, general system type and characteristics incl. airfield lighting, communication, etc. (proposed and/or existing)	R	A		
D-8	Water supply/waste treatment—availability, general system type and characteristics (proposed and/or existing)	NR			
D-9	Energy requirements/fuel conversion (sources, availability, loads, types of fuel, etc.)	R	A		
D-10	Solar energy evaluation	NR			
	Other Mechanical & Utility Systems (List and number items)				

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E. ENVIRONMENTAL CONSIDERATIONS

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
E-1	Waste water treatment, air quality, and solid waste disposal criteria	R		X	
	Other Environmental Considerations (List and number items)				

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technical data checklist

14

DA FORM 5024-E-R, Feb 82

COMMENTS

TECHNICAL DATA CHECKLIST

ITEM	COMMENT
E-1	Standard ballasts to be removed may contain PCBs, especially if manufactured before 1978. To meet federal hazardous waste disposal requirements, PCB-containing ballasts must be sealed in EPA-approved drums and either sent to approved storage sites or incinerated.

A. SPECIAL CONSIDERATIONS

See Tech. Data Checklist Item		ITEM	Required or Not Required	To Be Determined*	Comment Attached	Document Attached
A-1	A-1	Factors of risk, restriction, or unusual circumstance expected to increase costs beyond applicable area averages.	NR			
	(A)	Special applicable construction codes/criteria (NATO, SOFA, base regulations, use of government furnished documents, etc.)	NR			
	(B)	Skilled labor and/or structural material availability impact.	NR			
A-2	A-2	Construction phasing requirements	R	A		
	A-3	Unique contractor requirements (24 hr/day work capability; safety requirements—AR 385-10, DODI 1000.18, DODD 1000.3, DODI 6055.1; etc.)	NR			
	A-4	Utilities available to contractor (types, metering, costs, billing, etc.)	NR			
	A-5	Secure area availability for contractor equipment and materials storage	NR			
	A-6	Clearances required of contractor	R	A,B		
	A-7	Contractor work area (location, limits)	R	A,B		
A-3	A-8	Function support equipment (mechanical, electrical, structural support requirements)	NR			
D-1	(A)	Cranes and hoists (loads, controls, uses, etc.)	NR			
	A-9	Trash handling system (availability, storage area for recyclable material to coincide with installation resource recovery plan)	NR			
A-3, A-4, A-5	A-10	Real property installed equipment and furniture	NR			
	(A)	Functional support equipment	NR			
	(B)	Equipment in place	NR			
	(C)	Other equipment and furniture (O&MA, OPA)	NR			
	A-11	Disposition of scrap and salvage	R	C		
	A-12	Training of using service operating personnel (Operating Manual, etc.)	NR			
	A-13	Contingency plan for incidental discovery of archeological artifacts	NR			
	A-14	Maintenance and maintainability (i.e. avoiding features which have high maintenance requirements or new maintenance skills, etc.)	NR			
	A-15	Economic Considerations				
	(A)	Projected economic life associated with specified functional requirements.	NR			
	(B)	Special economic ranking considerations—design features for which factors other than economics (i.e., other than lowest LCC) should govern the decision as to which of the feasible alternatives should be selected, including statement of locally unacceptable alternatives and reasons therefor.	NR			
	(C)	Projected facility utilization/operation schedule.	R		X	
	(D)	Planned changes in facility usage during economic life and alterations to be required.	NR			
	(E)	Projected preventive-maintenance (p-m) strategy (e.g., full p-m as recommended by manufacturer; minimum p-m—replace failures as they occur, and little else; full p-m on critical items only; etc.).	NR			
	(F)	Projected strategy for custodial care and maintenance for most commonly used types of exterior and interior finishes (e.g., frequencies for sweeping, vacuuming, washing, painting, etc.).	NR			
	(G)	Design features that experience has shown require excessive M&R.	NR			

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COMMENTS

DESIGN DATA CHECKLIST

ITEM	COMMENT
A-15(C)	Assumption of utilization/operations schedules are included in Pine Bluff Arsenal Lighting Survey Report (June 1995).

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS (Continued)

See Tech. Data Checklist Item		ITEM	Required or Not Required	To Be Determined*	Comment Attached	Document Attached
D-5	D-8	Heat and chilled water distribution system (continued)				
D-6	(B)	Chilled water system				
	(1)	Type of service	NR			
	(2)	Existing system components	NR			
	(3)	Valving and sectionalizing requirements	NR			
	(4)	Allowable shut-down of service for main connections	NR			
	(5)	Sizing for future facilities	NR			
D-7	D-9	Electrical system				
	(A)	Power service characteristics & location	R	A		
	(B)	Stand-by power (available & required)	NR			
	(C)	Special interior functional lighting requirements (brightness, night, emergency, justification)	R		X	
	(D)	Uninterruptible power required	NR			
	(E)	Commercial tie-in requirements & restrictions	NR			
	(F)	Potential for increased power service needed	NR			
	(G)	Service outage duration limitations	NR			
	(H)	Security alarm systems (type & location)	NR			
	(I)	Street, parking or security lighting (brightness, hours, switching, etc.)	NR			
	(J)	Types of fixtures required (including mounting, NEC classification, etc.)	R	D	X	
	(K)	Telephone extension circuits or conduit (functional support & outlet location)	NR			
	(L)	Television circuits or conduit (functional support & outlet location)	NR			
	(M)	Intercom requirements (locations, type)	NR			
	(N)	Equipment list w/power requirements	NR			
	(O)	Special communications requirements (filtering, maximum fluctuation limitations, convertors, etc.)	NR			
	(P)	Electronic shielding & interference measures (frequency involved)	NR			
	(Q)	Special switches & control outlets, receptacle requirements, etc.	NR			
	(R)	Grounding requirements, lightning protection	NR			
	(S)	Hazardous environment requirements (location, activity involved, NEC classification, type of hazard)	NR			
	(T)	Corrosion control (cathodic protection)	NR			

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D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS (Continued)

See Tech. Data Checklist Item		ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
D-7	D-9	Electrical system (continued)				
	(U)	Other special power requirements (traffic control, antenna, etc.)	NR			
	(V)	Applicability of task lighting considerations	NR			
	(W)	Power management and metering requirements	NR			
	D-10	Electrical Distribution				
	(A)	Actual & estimated loads (peak & average (KW demand))	R		X	
	(B)	Utility compnay distribution system (substations, transmission lines, rate schedule, etc.)	NR			
	(C)	Government owned distribution system (switching station, transmission lines, feeders, etc.)	NR			
	(D)	Estimated impact of proposed equipment installation on power factor, load balance and costs for corrective action proposed	NR			
	(E)	Overhead/underground (voltage, conductor size, grounding, etc.)	NR			
	(F)	Estimated power demand factor and diversity factor	NR			
	(G)	Power quality requirements (voltage and frequency regulation)	NR			
	(H)	Power to intrusion, detection alarm systems around perimeter	NR			
	D-11	Airfield lighting requirements				
	(A)	Area & location to be served	NR			
	(B)	Source of power (normal & emergency)	NR			
	(C)	Vault requirements	NR			
	(D)	Primary feeders	NR			
	(E)	Control cabling	NR			
	(F)	Runway lighting (centerline, edge, distance markers, intensity control)	NR			
	(G)	Threshold, approach, & strobe beacon lighting	NR			
	(H)	Visual approach slope indicators (VASI)	NR			
	(I)	Obstructions lighting/barrier markers	NR			
	(J)	Taxiway edge lighting	NR			
	(K)	Helipad/heliport lighting (perimeter, landing direction, hoverlane, etc.)	NR			
D-8	D-12	Water supply system				
	(A)	Source (commercial, well, storage, etc.)	NR			
	(B)	Average rate of supply (FPD at PSI) Current & Future	NR			
	(C)	Treatment requirements	NR			
	(D)	Existing system components (type, size, capacity, age, material, location, valving, pressure, etc.)	NR			

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COMMENTS

DESIGN DATA CHECKLIST

ITEM	COMMENT
D-7(C)	Lighting requirements are IES standards, and included in the Pine Bluff Arsenal Lighting Survey Report (June 1995).
D-7(J)	Types of required fixtures are included in the Pine Bluff Arsenal Lighting Survey Report (June 1995).
D-10(A)	Estimated electric loads (kW demand) for the new lighting systems are included in the Pine Bluff Arsenal Lighting Survey Report (June 1995).

E. ENVIRONMENTAL CONSIDERATIONS

See Tech. Data Checklist Item		ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
E-1	E-1	Water quality				
	(A)	Waste water treatment management program (PL 92-500 & PL 95-217)	NR			
	(B)	Water quality criteria & standards (federal, state and local)	NR			
	(C)	Treatment requirements coordinated with EPA	NR			
	(D)	Facilities to be installed to meet regulatory agency criteria	NR			
E-1	E-2	Air quality				
	(A)	Applicable air quality criteria (federal, state and local; PL 95-95 and Clean Air Act Amendment of 1977)	NR			
	(B)	Action taken to comply with requirements	NR			
	(C)	Type & amount of pollutants generated	NR			
	(D)	Results of proposed abatement measures	NR			
	(E)	Existing control equipment & monitoring procedures	NR			
E-1	E-3	Solid waste disposal				
	(A)	Applicable solid waste criteria (federal, state and local)	R	C	X	
	(B)	Waste volume generated (type & characteristics)	NR			
	(C)	Method of disposal (land fill and availability of land, leachate, etc.)	R	C		
	(D)	Disposition of recyclable materials for reuse or as combustion fuel	R	C		
	(E)	Impact on installation recycling programs	NR			
	E-4	Effects of terrain changes (such as excavations, roadways, drainage structures, etc.)	NR			
	(A)	Measures to control erosion	NR			
E-1	E-5	Treatment of hazardous material				
	(A)	Handling and disposal of plychlorinated biphenyls (PCB) in electrical transformers	NR			
	(B)	Handling and disposal of asbestos materials	NR			
	(C)	Handling and disposal of fiberglass products	NR			
	(D)	Storage of fuels and solvents	NR			
	(E)	Coordination with installation spill control plans	NR			
		Other Environmental Considerations (list and number items)				

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COMMENTS

DESIGN DATA CHECKLIST

ITEM	COMMENT
E-3(A)	Standard ballasts to be removed may contain PCBs, especially if manufactured before 1978. To meet federal hazardous waste disposal requirements, PCB-containing ballasts must be sealed in EPA-approved drums and either sent to approved storage sites or incinerated.

installation: Pine Bluff Arsenal

project: High Efficiency Lighting (ECIP)

project number
temporary: 45976 program year FY 96

permanent: 45976 category code 80000

point of contact:

user
name Nancy Rimmer date 5 June 1995

title Energy Coordinator phone (501) 540-3312

autovon

dfae
name date

title phone

autovon

engineer district
name Mark Emmerling date 5 June 1995

title Electrical Engineer phone (501) 324-6905

autovon

other (A-E)
name Dr.Carlos S. Warren, PE date 5 June 1995

title Project Manager phone (904) 279-2275

autovon

reviewed by:

installation facility engineer
name date

title phone

autovon

approved by:

macom engineer
name date

title phone

autovon

project development brochure, PDB-2

facility

BUILDINGS:

10020, 10030, 10050, 13010, 13020, 13030, 13040, 13060, 13080
13100, 13110, 16210, 16220, 31010, 31080, 32030, 32035, 32060
32070, 32090, 32100, 32130, 32150, 33060, 33530, 34110, 34120
34140, 34910, 34970, 44100, 51420, 51430, 53160, 60020, 60060
60070, 60090, 60630, 63100, 63110, 63120, 63200, 63210, 63410

project coordinator for using service

NANCY RIMMER
(501) 540-3312

TABLE OF CONTENTS

OBJECTIVE

Pine Bluff Arsenal is required to meet stated goals of energy use reduction pursuant to Executive Order 12902, which calls for a 30-percent reduction in facility energy use by 2005, compared to energy use in 1985.

The objective of this project is to help the Arsenal meet the energy use reduction goals by improving the efficiency and utilization of fluorescent lighting systems, replacing incandescent lamps with fluorescent lamps, installing occupancy sensors in breakrooms and restrooms, and retrofitting incandescent exit signs with light-emitting-diodes (LEDs). These measures are implemented in 45 buildings on the Arsenal.

Implementation of this project will save approximately 3,135 MBtu of electricity each year which currently costs $63,108 annually. The SIR is 2.0 and the simple payback is 5.9 years. Approximately $2,600 in annual air-conditioning costs will be saved.

Occupants of the buildings are administrative, operations and support personnel. The buildings are all occupied, although numbers of occupants vary, based on mission.

BUILDING #	PRIMARY OPERATION
10020	Administration
10030	Administration
10050	Fire Headquarters
13010	Community Services
13020	Health Clinic
13030	52nd EOD
13040	Counseling Facility
13060	Clinic w/o beds
13080	Laboratory
13100	Infirmary
13110	Audio-visual Facility
16210	Barracks
16220	Barracks
31010	Electronics Calibration Lab
31080	Electronics Calibration Facility
32030	Inspection Garage
32035	Ordnance Shop
32060	Boiler and Compressor House
32070	Impregnation and Laundry
32090	Warehouse
32100	Electronics/Communication Calibration
32130	Ammunition Quality Assurance
32150	Ammunition Quality Assurance
33060	Boiler and Compressor House
33530	Fill and Press
34110	White Phosphorous Filling
34120	Ammunition Quality
34140	Boiler and Compressor House
34910	Admin/FE Maintenance Shop
34970	Administration
44100	Production Field Office

BUILDING #	PRIMARY OPERATION
51420	Offices (DMD)
51430	Engineers Administration
53160	Chemical Administration
60020	Security
60060	Administration
60070	Fixed Laundry
60090	TC Administration
60630	Warehouse
63100	Chemical Field Maintenance Shop
63110	Chemical Maintenance Shop
63120	Chemical Field Maintenance Shop
53200	Chemical Field Maintenance Shop
63210	Mask Repair
63410	Toxic/Conventional Change House

EXISTING FACILITIES

1. Existing lights in the 45 facilities mainly consist of fluorescent fixtures using T12 lamps and electromagnetic ballasts. The facilities also utilize incandescent lamps in some areas. Exit signs in the 45 buildings are illuminated by two, 15-watt incandescent lamps.

2. Many rooms in each building have illuminance levels in excess of U.S. Army guidelines and IES standards.

3. Some fixtures are very old, and very inefficient in light output (lumens per watt).

4. Based on room-by-room surveys and point-by-point calculations of lighting levels in each room of each building, 823 fixtures will be removed and replaced with 641 new fixtures, and 3,109 fixtures will be upgraded to higher efficiency and to conform to illuminance guidelines.

5. Upgrade of the 3,109 fixtures will be accomplished by removal of 8,776 T12 lamps, and 4,475 electromagnetic ballasts. The removed lamps and ballasts will be replaced by 6,464 T8 lamps and 3,109 electronic ballasts, along with reflectors installed in 270 fixtures to enhance the illuminance levels.

6. Occupancy sensors will be installed in 122 breakrooms and/or restrooms in 44 buildings.

7. Fifty-five exit signs will be retrofit with LEDs in the 45 buildings. It is recommended that 160 new exit signs be purchased, but the purchase is not included in this project.

detailed data	GENERAL REQUIREMENTS
organization:	contact: personnel:

GENERAL REQUIREMENTS

Electrical Demolition Work:

1. Remove existing fixtures, connections, and supports in buildings and rooms as indicated in Appendix A.

2. Remove lamps, lampholders, and ballasts from fixtures in buildings and rooms as indicated in Appendix A.

Electrical Construction Work:

1. Install new fixtures, connections and supports in buildings and rooms as indicated in Appendix A.

2. Install T8 lamps, electronic ballasts and reflectors in exiting fixtures in buildings and rooms as indicated in Appendix A.

3. Clean all existing fixtures where lamps and ballasts are installed.

NOTE: Fixture layouts in each room in each building are contained in Volume II of the Pine Bluff Arsenal Lighting Survey (June 1995).

A. SPECIAL CONSIDERATIONS

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
A-1	Cost estimates for each primary and supporting facility	R		X	
A-2	Telecommunications system coordination with USACC and authorization for exceptions	NR			
A-3	Coordination with state and local governmental requirements (blind vendors, medical facilities, construction and operating permits, clearinghouse coordination, etc.)	R	C		
A-4	Assignment of airspace	NR			
A-5	Economic analysis of alternatives	R		X	
A-6	Approval for new starts	R	A		
A-7	International balance of payments (IBOP) coordination with U.S. European command and NATO-overseas cost estimates and comparables (include rate of exchange used in estimates)	NR			
A-8	Impact on historic places–on site survey by authorized archeologist and coordination with state historic preservation officer and advisory council on historic preservation	NR			
A-9	Exceptions to established criteria	NR			
A-10	Physical Security Analysis and Threat Statement prepared by Provost Marshal/Physical Security Officer	NR			
A-11	Coordination with other various user staff agencies (G/S-2 intelligence Personnel)	NR			
A-12	Identification of related or support projects (so projects can be coordinated)	NR			
A-13	Required completion date	R	A		
	Other Special Considerations (list and number items)				

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documentation checklist

DA FORM 5023-A-R, Jan 87 EDITION OF FEB 82 IS OBSOLETE.

COMMENTS

DOCUMENTATION CHECKLIST

ITEM	COMMENT
A-1	Cost estimates are part of the 1391 package.
A-5	Economic analysis of alternative are included in 1391 package and Pine Bluff Arsenal Lighting Survey Report (June, 1995).

B. SITE DEVELOPMENT

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
B-1	Consultation with the District Office to determine and evaluate flood plain hazards	NR			
B-2	Preparation, submission, and/or approval of new –				
(A)	General Site Plan	NR			
(B)	Annotated General Site Plan	NR			
(C)	Sketch Site Plan	NR			
(D)	Facilities Requirements Sketch	NR			
B-3	Preparation of				
(A)	Site Survey	NR			
(B)	Subsoil Information	NR			
B-4	Approval by Department of Defense Explosive Safety Board (DDESB) for Safety Site Plan	NR			
B-5	Approval of site plan by Provost Marshal/Physical Security (Comparisons with Terrorist Threat Assessment)	NR			
	Other Site Development Considerations (list and number items)				

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C. ARCHITECTURAL & STRUCTURAL

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
C-1	Reconciliation with troop housing programs and requirements	NR			
C-2	Evaluation of existing facilities (including degree of utilization)	NR			
C-3	Approval for removal and relocation of existing useable facilities	NR			
C-4	Evaluation of off-post community facilities	NR			
C-5	Storage and maintenance facilities (including nuclear weapons)	NR			
C-6	Coordination hospitals, medical and dental facilities with Surgeon General	NR			
C-7	Coordination of aviation facilities with FAA	NR			
C-8	Coordination air traffic control and navigational aids with USACC	NR			
C-9	Tabulation of types and numbers of aircraft	NR			
C-10	Evaluation of laboratory, research and development, and technical maintenance facilities	NR			
C-11	Coordination chapels with Chief of Chaplains	NR			
C-12	Review food service facilities by USATSA	NR			
C-13	Automated data processing system or equipment approvals—cost analysis when ADP and/or communication centers not co-located with related facilities	NR			
C-14	Coordination postal facilities with U.S. Postal Service Regional Director	NR			
C-15	Laundry and dry cleaning facilities coordination with ASD(I&L)	NR			
C-16	Tenant facilities coordination with installation where sited	NR			
C-17	Facilities for or exposed to explosions, toxic chemicals, or ammunition—review by DDESB (See also Item B-4)	NR			
C-18	Analysis of deficiencies	NR			
C-19	Consideration of alternatives	NR			
C-20	Determination whether occupants will include physically handicapped or disabled persons	NR			
C-21	As-build drawings for alterations or additions	R	A		
C-22	Availability of Standard Design or site adaptable designs	NR			
C-23	Evaluation of facilities with Provost Marshal/Physical Security Officer (Installation Terrorist Threat Assessment)	NR			
	Other Architectural and Structural (list and number items)				

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*BY WHOM (Check and insert appropriate letter)

A – DFAE
B – Using Service
C – Construction Service
D – Designer
E – Other (Check Comments Attached and explain)

documentation checklist

DA FORM 5023-C-R, Jan 87 EDITION OF FEB 82 IS OBSOLETE.

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
D-1	Fuel considerations and cost comparison analysis	NR			
D-2	Energy requirements appraisal (ERA)	R		X	
D-3	Conformance with DOD Energy Reduction requirements	R		X	
D-4	Evaluation of existing and/or proposed utility systems	NR			
D-5	Evaluation of systems with Provost Marshal/Physical Security (Installation Terrorist Threat Assessment)	NR			
	Other Mechanical and Utility Systems (list and number items)				

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documentation checklist

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COMMENTS

DOCUMENTATION CHECKLIST

ITEM	COMMENT
D-2	ERA is part of 1391 package.
D-3	Project will reduce energy use at Pine Bluff Arsenal.

E. ENVIRONMENTAL CONSIDERATIONS

	ITEM	Required or Not Required	To Be * Determined	Comment Attached	Document Attached
E-1	Environmental impact assessment	NR			
E-2	EIA conclusions require Environmental Impact Statement	NR			
E-3	Determination of health, environmental or related hazards. Assistance to determine existence of any health, environmental or related hazard may be requested from Aberdeen Proving Ground, MD 21010, the Office of the Surgeon General, Attn: DASG-HCH (Army Environmental Hygiene Agency)	NR			
E-4	Air/water pollution permit, coordination with agencies and compliance with standards at Federal, state and local level	NR			
E-5	Corrective measures associated with Environmental Impact Statements or assessment—list separately and evaluate.	NR			
	Other environmental considerations (list and number items)				
E-6	Solid waste disposal criteria	R	C	X	

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documentation checklist

15

DA FORM 5023-E-R, Feb 82

COMMENTS

DOCUMENTATION CHECKLIST

ITEM	COMMENT
E-6	Standard ballasts to be removed may contain PCBs, especially if manufactured before 1978. To meet federal hazardous waste disposal requirements, PCB-containing ballasts must be sealed in EPA-approved drums and either sent to approved storage sites or incinerated.

F. PHYSICAL SECURITY ENHANCEMENT AGAINST TERRORIST THREAT

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
F-1	Preparation of the Physical Security Survey and Threat Analysis prepared by Provost Marshal/ Physical Security	NR			
F-2	Preparation, submission, and/or approval of site plan by Provost Marshal/Physical Security	NR			
F-3	Evaluation of mission essential project by Provost Marshal/Physical Security	NR			
F-4	Tabulation of Assets to be protected	NR			
F-5	Evaluation of ingress/egress time by intruder and security response time	NR			
F-6	Evaluation of Project by G/S-2 Intelligence Personnel	NR			

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documentation checklist

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DA FORM 5023-F-R, Jan 87

A. SPECIAL CONSIDERATIONS

	ITEM	Required or Not Required	To Be * Determined	Comment Attached	Document Attached
A-1	Factors of risk, restriction or unusual circumstance expected to increase costs beyond applicable area averages	NR			
A-2	Construction phasing requirements	R	A,B		
A-3	Functional support equipment (mechanical, electrical, structural, and security) to be built in	NR			
A-4	Equipment in place and justification	NR			
A-5	Other equipment and furniture (O&MA, OPA) and costs	NR			
A-6	Special studies and tests (hazards analyses, compatibility testing, new technology testing, etc.)	NR			
A-7	Type of construction (permanent, temporary, semi-permanent)	NR			
A-8	Government furnished equipment (quantities, procurement time, availability and special handling and storage requirements). Funds used for procurement.	NR			
	Other special considerations (list and number items)				

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technical data checklist

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DA FORM 5024-A-R, Feb 82

B. SITE DEVELOPMENT

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
B-1	Construction restrictions or guidelines pertaining to				
(A)	site access and preferred construction routes	NR			
(B)	Airfield clearance, explosive storage, working hours, safety, etc.	NR			
(C)	Facilities and/or functions or adjoining areas (structures, materials, impact)	NR			
B-2	Real estate actions (acquisition, disposal, lease, right-of-way)	NR			
B-3	Demolition/relocation required (data)				
(A)	Special considerations due to explosives/radioactivity/ chemical contamination/asbestos emissions/toxic gases	R	A,B		
(B)	Restrictions on disposal of demolished/relocated material including hazardous waste	NR			
B-4	Pavement types and requirements (including traffic surveys and MTMC coordination)	NR			
B-5	Landscape considerations				
(A)	Protection of existing vegetation	NR			
(B)	Stockpile topsoil	NR			
	Other Site Development (List and number items)				

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technical data checklist

DA FORM 5024-B-R, Feb 82

C. ARCHITECTURAL & STRUCTURAL

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
C-1	Vibration-producing equipment requiring isolation	NR			
C-2	Seismic zone and other design load criteria (typhoon, hurricane, earthquake loads, high or low loss potential)	NR			
C-3	Protective shelter evaluation and resistant design criteria (conventional/nuclear blast and radiation, chemical/biological)	NR			
C-4	Unusual foundation requirements (pier, pile, caisson, deep foundations, mat, special treatment, permafrost areas, soil bearing)	NR			
C-5	Designation and strength of units to be accommodated	NR			
C-6	Requirements and data for special design projects	NR			
C-7	Unusual floor and roof loads (safes, equipment)	NR			
C-8	Security features (arms rooms, vaults, interior secure areas)	NR			
	Other Architectural & Structural (List and number items)				

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technical data checklist

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DA FORM 5024-C-R, Feb 82

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
D-1	Special mechanical requirements or considerations (elevator, crane, hoist, etc.)	NR			
D-2	Special peak usage periods and peak leveling techniques	NR			
D-3	Maintenance considerations (accessibility of equipment, compatibility with existing equipment)	NR			
D-4	Plumbing—availability, general system type and characteristics (proposed and/or existing, incl. compressed air and gas)	NR			
D-5	Heating—availability, general system type and characteristics (proposed and/or existing)	NR			
D-6	Ventilating, air condition/refrigeration—availability, general system type and characteristics (proposed and/or existing)	NR			
D-7	Electrical—availability, general system type and characteristics incl. airfield lighting, communication, etc. (proposed and/or existing)	R	A		
D-8	Water supply/waste treatment—availability, general system type and characteristics (proposed and/or existing)	NR			
D-9	Energy requirements/fuel conversion (sources, availability, loads, types of fuel, etc.)	R	A		
D-10	Solar energy evaluation	NR			
	Other Mechanical & Utility Systems (List and number items)				

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technical data checklist

DA FORM 5024-D-R, Feb 82

E. ENVIRONMENTAL CONSIDERATIONS

ITEM		Required or Not Required	* To Be Determined	Comment Attached	Document Attached
E-1	Waste water treatment, air quality, and solid waste disposal criteria	R		X	
	Other Environmental Considerations (List and number items)				

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technical data checklist

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DA FORM 5024-E-R, Feb 82

COMMENTS

TECHNICAL DATA CHECKLIST

ITEM	COMMENT
E-1	Standard ballasts to be removed may contain PCBs, especially if manufactured before 1978. To meet federal hazardous waste disposal requirements, PCB-containing ballasts must be sealed in EPA-approved drums and either sent to approved storage sites or incinerated.

F. FIRE PROTECTION

ITEM		Required or Not Required	* To Be Determined	Comment Attached	Document Attached
F-1	Special fire protection systems or features (detection and suppression equipment, hazards, etc.)	NR			
	Other Fire Protection Considerations (List and number items)				

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technical data checklist 24

DA FORM 5024-F-R, Feb 82

G. PHYSICAL SECURITY ENHANCEMENT AGAINST TERRORIST THREAT

	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
G-1	Site Considerations Related to Physical Security Enhancements	NR			
G-2	Site Protective Barriers				
(A)	Active	NR			
(B)	Passive	NR			
G-3	Architectural and Structural Considerations				
(A)	Protective shelters and secure areas	NR			
(B)	Passive Design features	NR			
(C)	Lock and key systems	NR			
G-4	Mechanical, Electrical, Utility Systems				
(A)	Security lighting	NR			
(B)	IDS	NR			
(C)	Communications	NR			
(D)	EMP Protection	NR			
(E)	Personnel Identification Systems	NR			
(F)	Biological and Chemical Protection for Utilities	NR			
G-5	Other Special Security Features (arms rooms, vaults, nuclear storage, etc.)				

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A. SPECIAL CONSIDERATIONS

See Tech. Data Checklist Item	ITEM		Required or Not Required	* To Be Determined	Comment Attached	Document Attached
A-1	A-1	Factors of risk, restriction, or unusual circumstance expected to increase costs beyond applicable area averages.	NR			
	(A)	Special applicable construction codes/criteria (NATO, SOFA, base regulations, use of government furnished documents, etc.)	NR			
	(B)	Skilled labor and/or structural material availability impact.	NR			
A-2	A-2	Construction phasing requirements	R	A		
	A-3	Unique contractor requirements (24 hr/day work capability; safety requirements—AR 385-10, DODI 1000.18, DODD 1000.3, DODI 6055.1; etc.)	NR			
	A-4	Utilities available to contractor (types, metering, costs, billing, etc.)	NR			
	A-5	Secure area availability for contractor equipment and materials storage	NR			
	A-6	Clearances required of contractor	R	A,B		
	A-7	Contractor work area (location, limits)	R	A,B		
A-3	A-8	Function support equipment (mechanical, electrical, structural support requirements)	NR			
D-1	(A)	Cranes and hoists (loads, controls, uses, etc.)	NR			
	A-9	Trash handling system (availability, storage area for recyclable material to coincide with installation resource recovery plan)	NR			
A-3, A-4, A-5	A-10	Real property installed equipment and furniture	NR			
	(A)	Functional support equipment	NR			
	(B)	Equipment in place	NR			
	(C)	Other equipment and furniture (O&MA, OPA)	NR			
	A-11	Disposition of scrap and salvage	R	C		
	A-12	Training of using service operating personnel (Operating Manual, etc.)	NR			
	A-13	Contingency plan for incidental discovery of archeological artifacts	NR			
	A-14	Maintenance and maintainability (i.e. avoiding features which have high maintenance requirements or new maintenance skills, etc.)	NR			
	A-15	Economic Considerations				
	(A)	Projected economic life associated with specified functional requirements.	NR			
	(B)	Special economic ranking considerations—design features for which factors other than economics (i.e., other than lowest LCC) should govern the decision as to which of the feasible alternatives should be selected, including statement of locally unacceptable alternatives and reasons therefor.	NR			
	(C)	Projected facility utilization/operation schedule.	R		X	
	(D)	Planned changes in facility usage during economic life and alterations to be required.	NR			
	(E)	Projected preventive-maintenance (p-m) strategy (e.g., full p-m as recommended by manufacturer; minimum p-m—replace failures as they occur, and little else; full p-m on critical items only; etc.).	NR			
	(F)	Projected strategy for custodial care and maintenance for most commonly used types of exterior and interior finishes (e.g., frequencies for sweeping, vacuuming, washing, painting, etc.).	NR			
	(G)	Design features that experience has shown require excessive M&R.	NR			

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COMMENTS

DESIGN DATA CHECKLIST

ITEM	COMMENT
A-15(C)	Assumption of utilization/operations schedules are included in Pine Bluff Arsenal Lighting Survey Report (June 1995).

B. SITE DEVELOPMENT

See Tech. Data Checklist Item		ITEM	Required or Not Required	To Be Determined*	Comment Attached	Document Attached
B-1	B-1	Required site plans (incl. design and construction factors)	NR			
	(A)	Site access and preferred construction routes	NR			
	(B)	Site restrictions (airfield clearance, explosive storage, etc.)	NR			
	(C)	Existing facilities/functions on adjoining areas (structures, materials, impact)	NR			
	(D)	Disposal areas (trash, excavated material, constraints)	NR			
	(E)	Borrow and spoil areas	NR			
	(F)	Grades or contours existing	NR			
	(G)	Existing trees, turf, ground cover, landscape development, erosion control	NR			
	(H)	Bridges and fences (applicable design criteria)	NR			
	(I)	Railroads (routing, sidings, docks, yards, grounding)	NR			
	(J)	Fire station and security police location	NR			
	(K)	Site utilities—capacity and quantity available to project (sanitary and storm sewers, drainage ditches, water and gas service, communication lines, hydrants and sprinklers, etc.)	NR			
	(L)	New facilities clearly identified	NR			
	(M)	Necessary support facilities required for complete functional project (warehouse, igloo, fuel storage, waste treatment, etc.)	NR			
C-4	B-2	Subsoil conditions (actual or expected—groundwater, permafrost, etc.)	NR			
B-2	B-3	Real estate actions (acquisition, disposal, lease, right-of-way)	NR			
B-3	B-4	Demolition/relocation required to clear site (date)	NR			
B-4	B-5	Pavement types and requirements	NR			
	(A)	Design loading and use frequency by type of paving	NR			
	(B)	Street size and layout (traffic control)	NR			
	(C)	Parking lots (signage, etc.)	NR			
	(D)	Sidewalks and curbs (handicapped, etc.)	NR			
	(E)	Gutters, culverts and other drainage factors	NR			
	(F)	Runways, aprons and taxiways	NR			
	(G)	Tie-down anchors or grounds	NR			
	(H)	Special surface conditions required	NR			
D-9, D-10	B-6	Energy conservation siting and features (wind solar, etc.). See also DDC Item D-13 (D) & (E)	NR			

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B. SITE DEVELOPMENT (Continued)

See Tech. Data Checklist Item		ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
B-5	B-7	Landscape treatment				
	(A)	Preservation of existing features	NR			
	(B)	Proposed planting (low maintenance species, locations away from power lines, etc.)	NR			
B-5	B-8	Storm drainage (See also Item E-4)				
	(A)	Total run-off area affecting project	NR			
	(B)	Design intensity for floods	NR			
	(C)	Design of storm drainage system to include pick-up system and outfall lines	NR			
	B-9	Consideration of Coastal Zone Management Act (PL 92-583, 1972; Amendment PL 94-370, 1976)	NR			
		Other Site Development Considerations (List and number items)				

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C. ARCHITECTURAL & STRUCTURAL

See Tech. Data Checklist Item		ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
	C-1	Material availability limitations (include fill and paving)	NR			
	C-2	Architectural style (existing, planned or desired, use of pre-engineered buildings considered)	NR			
C-7	C-3	Floors (type, finish, special loading, subgrade moisture control, low maintenance types particularly in spill areas)	NR			
C-3	C-4	Walls				
	(A)	Exterior (materials, sealing of joints, general maintenance)	NR			
	(B)	Interior walls and partitions (material, finish, fire resistance, subgrade moisture control)	NR			
	C-5	Ceilings (height, finish, acoustics)	NR			
	C-6	Windows (type, size, special treatment)	NR			
	C-7	Doors (type, size, power operation, panic hardware, durability)	NR			
	C-8	Hardware (finish, location, special metal restrictions, durability)	NR			
	C-9	Special finishes (protective coatings, non-sparking, conductive, acid-resistant)	NR			
C-8	C-10	Security features (windows, doors, hardware, construction of walls, floors & ceilings, arms rooms, vaults, etc.)	NR			
	C-11	Sound attenuation requirements (expected and required levels, location)	NR			
	C-12	Stairs, elevators and chutes (location, size, type of usage)	NR			
	C-13	Loading docks and canopies	NR			
C-1	C-14	Vibration-producing equipment requiring isolation	NR			
C-4	C-15	Unusual foundation requirements (pier, pile, caisson, deep foundations, mat, special treatment, creep control)	NR			
	C-16	Span or unusual clearance requirements (span or height)	NR			
	C-17	Special bay sizes (reflect access dimensions)	NR			
	C-18	Overhead support requirements (hoists, cranes)	NR			
C-7	C-19	Roof loads and requirements (live/dead loads, materials, access, low maintenance features like exterior drains, etc.)	NR			
	C-20	Structural specialities (slabs, sumps, trenches, pits)	NR			
C-2	C-21	Seismic zone design criteria	NR			
C-2	C-22	Area wind loads (summer/winter prevailing wind, hurricane, typhoon)	NR			
C-3	C-23	Protective shelter evaluation and resistant design criteria	NR			
	(A)	Explosive/nuclear blast (protective, resistive, suppressive, venting and containment structures)	NR			
	(B)	Radiation protection (type of radiation, intensity, source)	NR			
	(C)	Chemical/biological protection	NR			

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C. ARCHITECTURAL & STRUCTURAL (Continued)

See Tech. Data Checklist Item		ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
C-5	C-24	Designation and strength of units to be accommodated	NR			
C-6	C-25	Requirements for special design projects	NR			
	C-26	Safety features (occupant load, maximum travel distance to exits, hazard to be controlled or eliminated)	NR			
	C-27	Special design features for handicapped.	NR			
		Other Architectural and Structural (list and number items)				

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design data checklist

DA FORM 5025-C-2-R, Feb 82

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

See Tech. Data Checklist Item		ITEM	Required or Not Required	To Be Determined *	Comment Attached	Document Attached
D-1	D-1	Special mechanical requirements or considerations	NR			
D-2	D-2	Special peak usage periods and peak leveling techniques	NR			
D-3	D-3	Maintenance considerations (equipment room size, layout, location, general accessibility of equipment, compatibility with existing equipment.)	NR			
D-9	D-4	Energy monitoring control system (EMCS) and permanent utilities metering	NR			
D-4	D-5	Plumbing system (proposed and/or existing)				
	(A)	General piping and storage system	NR			
	(1)	Materials (galvanized, copper, etc.)	NR			
	(2)	Insulation	NR			
	(3)	Natural or LP gas	NR			
	(4)	Venting	NR			
	(5)	Distilled water	NR			
	(6)	Compressed air	NR			
	(7)	Hospital & surgical gases	NR			
	(8)	Other (chemical, fuel)	NR			
	(B)	Facility water supply	NR			
	(C)	Garbage disposal	NR			
	(D)	Sanitary drainage system	NR			
	(E)	Grease interception	NR			
	(F)	Chemical waste drainage & disposal (incl. explosive process waste)	NR			
	(G)	Radioactive waste	NR			
	(H)	Drinking fountains	NR			
	(I)	Water treatment	NR			
	(J)	Emergency fixtures (showers, eyewash fountains)	NR			
D-5	D-6	Heating system				
	(A)	Existing generation plant	NR			
	(1)	Location and distance from new facility	NR			
	(2)	Equipment (type, age, fuel, etc.)	NR			
	(3)	Current loads (average, peak, reserves for this and other projects, load leveling system)	NR			
	(4)	Type of plant	NR			
	(5)	Manning & support requirements	NR			
	(6)	Pollution controls	NR			
	(7)	Type of product	NR			

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D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS (Continued)

See Tech. Data Checklist Item		ITEM	Required or Not Required	To Be Determined*	Comment Attached	Document Attached
D-5	D-6	Heating system (continued)				
	(B)	Requirements for proposed facility	NR			
	(1)	Type of system	NR			
	(2)	Heat load requirements (special temperature demands)	NR			
	(3)	Controls, metering & EMCS requirements	NR			
	(4)	Distribution system (valves, steam pressure, fluid temperature)	NR			
	(5)	Corrosion control	NR			
	(6)	Insulation	NR			
	(7)	Additional equipment specifications	NR			
D-6	D-7	Ventilating/air conditioning/refrigeration system				
	(A)	Existing facilities				
	(1)	Location	NR			
	(2)	Type of plant (refrigeration, chilled water, etc.)	NR			
	(3)	Current loads (average, peak, reserves for this and other projects, load leveling system)	NR			
	(4)	Type of product (CFM, temperature, GPM, etc.)	NR			
	(5)	Distribution system	NR			
	(6)	Special filtration requirements	NR			
	(7)	Special humidity, ventilation, or temperature requirements	NR			
	(8)	Security restrictions for open ducting	NR			
	(9)	Freezers or coolers	NR			
	(B)	Requirements for proposed facility				
	(1)	Type of system	NR			
	(2)	Temperature, humidity and vent conditions special to this design	NR			
	(3)	Control, cycling, metering and EMCS requirements	NR			
	(4)	Distribution (length of extension, location, fluid temperature)	NR			
	(5)	Corrosion control	NR			
	(6)	Insulation	NR			
	(7)	Special fire and security considerations for this project	NR			
	(8)	Occupancy hours and days per week	NR			
D-5, D-6	D-8	Heat and chilled water distribution system				
	(A)	Heat system				
	(1)	Type of service	NR			
	(2)	Existing system components	NR			
	(3)	Valving and sectionalizing requirements	NR			
	(4)	Allowable shut-down of service for main connections	NR			
	(5)	Sizing for future facilities	NR			

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D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS (Continued)

See Tech. Data Checklist Item		ITEM	Required or Not Required	To Be Determined*	Comment Attached	Document Attached
D-5	D-8	Heat and chilled water distribution system (continued)				
D-6	(B)	Chilled water system				
	(1)	Type of service	NR			
	(2)	Existing system components	NR			
	(3)	Valving and sectionalizing requirements	NR			
	(4)	Allowable shut-down of service for main connections	NR			
	(5)	Sizing for future facilities	NR			
D-7	D-9	Electrical system				
	(A)	Power service characteristics & location	R	A		
	(B)	Stand-by power (available & required)	NR			
	(C)	Special interior functional lighting requirements (brightness, night, emergency, justification)	NR			
	(D)	Uninterruptible power required	R		X	
	(E)	Commercial tie-in requirements & restrictions	NR			
	(F)	Potential for increased power service needed	NR			
	(G)	Service outage duration limitations	NR			
	(H)	Security alarm systems (type & location)	NR			
	(I)	Street, parking or security lighting (brightness, hours, switching, etc.)	NR			
	(J)	Types of fixtures required (including mounting, NEC classification, etc.)	R	D	X	
	(K)	Telephone extension circuits or conduit (functional support & outlet location)	NR			
	(L)	Television circuits or conduit (functional support & outlet location)	NR			
	(M)	Intercom requirements (locations, type)	NR			
	(N)	Equipment list w/power requirements	NR			
	(O)	Special communications requirements (filtering, maximum fluctuation limitations, convertors, etc.)	NR			
	(P)	Electronic shielding & interference measures (frequency involved)	NR			
	(Q)	Special switches & control outlets, receptacle requirements, etc.	NR			
	(R)	Grounding requirements, lightning protection	NR			
	(S)	Hazardous environment requirements (location, activity involved, NEC classification, type of hazard)	NR			
	(T)	Corrosion control (cathodic protection)	NR			

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D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS (Continued)

See Tech. Data Checklist Item		ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
D-7	D-9	Electrical system (continued)				
	(U)	Other special power requirements (traffic control, antenna, etc.)	NR			
	(V)	Applicability of task lighting considerations	NR			
	(W)	Power management and metering requirements	NR			
	D-10	Electrical Distribution				
	(A)	Actual & estimated loads (peak & average (KW demand))	R		X	
	(B)	Utility compnay distribution system (substations, transmission lines, rate schedule, etc.)	NR			
	(C)	Government owned distribution system (switching station, transmission lines, feeders, etc.)	NR			
	(D)	Estimated impact of proposed equipment installation on power factor, load balance and costs for corrective action proposed	NR			
	(E)	Overhead/underground (voltage, conductor size, grounding, etc.)	NR			
	(F)	Estimated power demand factor and diversity factor	NR			
	(G)	Power quality requirements (voltage and frequency regulation)	NR			
	(H)	Power to intrusion, detection alarm systems around perimeter	NR			
	D-11	Airfield lighting requirements				
	(A)	Area & location to be served	NR			
	(B)	Source of power (normal & emergency)	NR			
	(C)	Vault requirements	NR			
	(D)	Primary feeders	NR			
	(E)	Control cabling	NR			
	(F)	Runway lighting (centerline, edge, distance markers, intensity control)	NR			
	(G)	Threshold, approach, & strobe beacon lighting	NR			
	(H)	Visual approach slope indicators (VASI)	NR			
	(I)	Obstructions lighting/barrier markers	NR			
	(J)	Taxiway edge lighting	NR			
	(K)	Helipad/heliport lighting (perimeter, landing direction, hoverlane, etc.)	NR			
D-8	D-12	Water supply system				
	(A)	Source (commercial, well, storage, etc.)	NR			
	(B)	Average rate of supply (FPD at PSI) Current & Future	NR			
	(C)	Treatment requirements	NR			
	(D)	Existing system components (type, size, capacity, age, material, location, valving, pressure, etc.)	NR			

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design data checklist

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DA FORM 5025-D-4-R, Feb 82

COMMENTS

DESIGN DATA CHECKLIST

ITEM	COMMENT
D-7(C)	Lighting requirements are IES standards, and included in the Pine Bluff Arsenal Lighting Survey Report (June 1995).
D-7(J)	Types of required fixtures are included in the Pine Bluff Arsenal Lighting Survey Report (June 1995).
D-10(A)	Estimated electric loads (kW demand) for the new lighting systems are included in the Pine Bluff Arsenal Lighting Survey Report (June 1995).

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS (Continued)

See Tech. Data Checklist Item		ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
D-8	D-12	Water supply system (continued)				
	(E)	Chemical analysis of water	NR			
	(F)	Emergency storage requirements	NR			
	(G)	Peak hours of supply (hours & estimated quantity)	NR			
	(H)	Known minimal requirements of supported function or Government equipment (quantity & quality)	NR			
	(I)	Chemical feeder & piping systems	NR			
	(J)	Corrosion control (existing & planned)	NR			
	(K)	Metering or usage restrictions	NR			
	(L)	Location of tie points (available capacity, interruption schedule)	NR			
D-8	D-13	Waste water treatment system				
	(A)	Existing system & components (size, capacity, characteristics)				
	(1)	Treatment plant	NR			
	(2)	Collector sewers	NR			
	(3)	Sewer mains (materials, depth)	NR			
	(4)	Complete treatment – industrial process	NR			
	(5)	Chemical, fuel or oil spill collection facilities	NR			
	(6)	Existing flows (min., avg., peak)	NR			
	(7)	Hydraulic capacity	NR			
	(B)	Known/estimated industrial or functional discharges (quantity & quality)	NR			
	(C)	Contributory population & per capita contribution	NR			
	(D)	Proposed system & components				
	(1)	Treatment plant	NR			
	(2)	Collection sewers	NR			
	(3)	Lift station	NR			
	(4)	Complete treatment (additions or modifications)	NR			
	(5)	Chemical, fuel or oil spill collection facilities	NR			
	(6)	Waste water from portable water treatment plant	NR			
	(7)	Projected flows—average or peak	NR			
	(8)	By-pass restrictions	NR			
	(9)	Location of tie points (available capacity, interruption schedule)	NR			
	(E)	Compliance requirements (federal, state, local)	NR			
	(F)	National Pollution Discharge Elimination System (NPDES) permit	NR			
	(G)	Corrosion control (existing or planned)	NR			

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D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS (Cont.)

See Tech. Data Checklist Item		ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
D-9	D-14	Energy Sources				
	(A)	Gas systems (LP, natural, special)				
	(1)	Loads and areas served	NR			
	(2)	Source of gas & type of service	NR			
	(3)	Supply pressure average	NR			
	(4)	Heating valve & type of gas (BTU per cubic foot)	NR			
	(5)	Valving & sectionalizing criteria	NR			
	(6)	Pressure regulation – reduction stations	NR			
	(7)	Existing lines, pumping stations, pressurization, base system	NR			
	(8)	Control & metering	NR			
	(B)	POL systems				
	(1)	Fuel (primary or standby source, grade and analysis)	NR			
	(2)	Storage (tank size, location, type, number of storage days)	NR			
	(3)	Areas served	NR			
	(4)	Fuel requirements (known, estimated, quantity & type)	NR			
	(5)	Distribution system characteristics (piping, types of fuel, pumps, capacities)	NR			
	(6)	Ventilation system (Vapor Emission Control)	NR			
	(7)	Safety specifications	NR			
	(8)	Filter separators	NR			
	(C)	Coal systems				
	(1)	Storage (location & capacity)	NR			
	(2)	Source of supply (primary & emergency)	NR			
	(3)	Type, energy value, analysis (i.e. sulfur, ash, etc.)	NR			
	(D)	Solar energy systems				
	(1)	Building heating, air conditioning, domestic hot water	NR			
	(2)	Heating process water	NR			
	(3)	Collector type & location	NR			
	(4)	Liquid, chemical or rock storage	NR			
	(5)	Freeze protection	NR			
	(E)	Energy conservation data (U values, orientation, passive solar considerations, etc.)	NR			
		Other Mechanical & Utility Systems (list and number items)				

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E. ENVIRONMENTAL CONSIDERATIONS

See Tech. Data Checklist Item		ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
E-1	E-1	Water quality				
	(A)	Waste water treatment management program (PL 92-500 & PL 95-217)	NR			
	(B)	Water quality criteria & standards (federal, state and local)	NR			
	(C)	Treatment requirements coordinated with EPA	NR			
	(D)	Facilities to be installed to meet regulatory agency criteria	NR			
E-1	E-2	Air quality				
	(A)	Applicable air quality criteria (federal, state and local; PL 95-95 and Clean Air Act Amendment of 1977)	NR			
	(B)	Action taken to comply with requirements	NR			
	(C)	Type & amount of pollutants generated	NR			
	(D)	Results of proposed abatement measures	NR			
	(E)	Existing control equipment & monitoring procedures	NR			
E-1	E-3	Solid waste disposal				
	(A)	Applicable solid waste criteria (federal, state and local)	R	C	X	
	(B)	Waste volume generated (type & characteristics)	NR			
	(C)	Method of disposal (land fill and availability of land, leachate, etc.)	R	C		
	(D)	Disposition of recyclable materials for reuse or as combustion fuel	R	C		
	(E)	Impact on installation recycling programs	NR			
	E-4	Effects of terrain changes (such as excavations, roadways, drainage structures, etc.)	NR			
	(A)	Measures to control erosion	NR			
E-1	E-5	Treatment of hazardous material				
	(A)	Handling and disposal of plychlorinated biphenyls (PCB) in electrical transformers	NR			
	(B)	Handling and disposal of asbestos materials	NR			
	(C)	Handling and disposal of fiberglass products	NR			
	(D)	Storage of fuels and solvents	NR			
	(E)	Coordination with installation spill control plans	NR			
		Other Environmental Considerations (list and number items)				

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COMMENTS

DESIGN DATA CHECKLIST

ITEM	COMMENT
E-3(A)	Standard ballasts to be removed may contain PCBs, especially if manufactured before 1978. To meet federal hazardous waste disposal requirements, PCB-containing ballasts must be sealed in EPA-approved drums and either sent to approved storage sites or incinerated.

F. FIRE PROTECTION

See Tech. Data Checklist Item		ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
F-1	F-1	General design guidance				
	(A)	Occupancy type (see NFPA 101, Chap 4)	NR			
	(B)	Water supply characteristics (existing or planned extensions) (capacity, pump activation, storage tanks and pumps, etc.)	NR			
	(C)	Mobile fire apparatus (response distance/time)	NR			
	(D)	Fire detection and alarm systems (existing or planned, type, location, etc.)	NR			
	(E)	Automatic suppression systems (water sprinkler, CO_2, foam etc.—existing or planned	NR			
	(F)	Hazard of contents (low, ordinary, high-see NFPA 101; type—explosives, flammable/toxic chemicals, radioactive materials)	NR			
F-1	F-2	Special fire suppression system requirements				
	(A)	Means of egress	NR			
	(B)	Fire area limitations	NR			
	(C)	Fire walls, partitions, draft curtains	NR			
	(D)	Detection system (type, detectors, supervision, transmitters, annunciators, backup provisions)	NR			
	(E)	Suppression system (damage by water to costly equipment, shut down of operations)	NR			
		Other Fire Protection (list and number items)				

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G. PHYSICAL SECURITY ENHANCEMENT AGAINST TERRORIST THREAT

See Tech. Data Checklist Item	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
G-1	Site Considerations Related to Physical Security Enhancements				
	(A) Access Road Alignment	NR			
	(B) Establishment of Clear Zones	NR			
	(C) Entry Control Points	NR			
	(D) Security Features on Utilities	NR			
	(E) Security and IDS Features on Storm/Sewage Drainage Systems	NR			
	(F) Location of Parking Lots Remote from Primary Facility	NR			
	(G) Specific Orientation of Primary Facility	NR			
	(H) Salley Ports	NR			
G-2	Site Protective Barriers				
	(A) Active Barriers	NR			
	(1) Pop up barriers	NR			
	(2) Beam barriers	NR			
	(3) Gates	NR			
	(B) Passive Barriers				
	(1) Fences	NR			
	(2) Signage	NR			
	(3) Landscape	NR			
	(4) Berms of revetting walls to mitigate blast effects	NR			
	(5) Concrete barriers	NR			
G-3	Architectural and Structural Considerations				
C-3					
C-7	(A) Protective Shelters and Secure Areas				
C-8	(1) Security towers	NR			
	(2) Guard houses	NR			
	(3) Secure areas within primary facility	NR			
	(4) Entry control points	NR			
G-3	(B) Passive Design Features				
	(1) Building configuration and space arrangement considering physical security	NR			
	(2) Perimeter wall protection	NR			
	(3) Limit use of doors and windows	NR			
	(4) Proper location and elevation of windows	NR			
	(5) Ballistic Attack hardening	NR			
	(6) Effective design against forced entry	NR			
	(7) Facility structural hardening (floors, walls, and ceilings)	NR			

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G. PHYSICAL SECURITY ENHANCEMENT AGAINST TERRORIST THREAT *(CONTINUED)*

See Tech. Data Checklist Item	ITEM	Required or Not Required	* To Be Determined	Comment Attached	Document Attached
	(C) Lock and Key Systems	NR			
C-4	Mechanical, Electrical, and Utility Considerations	NR			
D-4	(A) Security Lighting				
	(1) Exterior	NR			
	(2) Interior	NR			
	(3) Emergency lighting	NR			
	(4) Emergency power	NR			
	(B) Intrusion Detection System (IDS)				
	(1) JSIIDS (Joint Services Interior IDS)	NR			
	(2) FIDS (Facility IDS)	NR			
	(3) FIEPSS (Fixed Installation Exterior Perimeter Sensor System)	NR			
	(4) BISS (USAF Base and Installation Security System)	NR			
	(5) IDS for Nuclear Storage	NR			
	(C) Communications	NR			
	(D) EMP Protection	NR			
	(E) Personnel Identification Systems	NR			
	(F) Nuclear, Biological, and Chemical Protection for Utilities	NR			
G-5	Other Special Security Features				
C-3	(A) Arms Room	NR			
C-7	(B) Vaults	NR			
C-8	(C) Nuclear Storage	NR			
	(D) Cryptographic Vaults	NR			
	(E) Security Control Center	NR			
	(F) Storage and Medical Substances	NR			

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APPENDIX A
FIXTURE CHANGEOUT
SUMMARY AND DETAILS

Table 4-3. Fixture Changeout Summary

	Bldg. No.	Function	Fixtures Removed	Fixtures Installed	Fixtures Upgraded	Reflectors Installed	T12 Lamps Removed	EM Blsts Removed	T8 Lamps Installed	El. Blsts Installed
1	10020	Administration	169	149	44	40	164	84	88	44
2	10030	Admin General Purpose	4	2	67	21	224	112	155	67
3	10050	Fire HQ	6	4	46	17	126	63	92	46
4	13010	Community Services	0	0	28	2	104	52	56	28
5	13020	Health Clinic	12	11	34	13	90	45	76	34
6	13030	52nd EOD	0	0	25	7	84	42	74	25
7	13040	Counseling Facility	5	1	26	0	52	26	52	26
8	13060	Clinic	3	0	17	5	68	34	34	17
9	13080	Laboratory	21	21	2	0	8	4	8	2
10	13100	Infirmary	2	2	15	0	38	19	36	15
11	13110	Audio-Visual Facility	5	1	29	0	84	42	68	29
12	16210	Barracks (halls, showers, latrines)	8	3	15	0	24	15	24	15
13	16220	Barracks (halls, showers, latrines)	8	3	15	0	24	15	24	15
14	31010	Electronic Calibration	0	0	6	0	24	12	24	6
15	31080	Electronic Calibration	0	0	24	0	90	45	68	24
16	32030	Inspection Garage	15	22	4	0	8	4	8	4
17	32035	Ordinance Shop	0	0	252	0	504	252	504	252
18	32060	Boiler & Compressor House	0	0	9	0	21	12	21	9
19	32070	Impreg. & Laundry	1	0	103	0	212	106	212	103
20	32090	Warehouse	0	0	60	24	240	120	122	60
21	32100	Elect/Comm. Calibration	3	0	135	3	464	232	282	135
22	32130	Ammo Quality Assurance	3	2	49	48	194	97	98	49
23	32150	Ammo Quality Assurance	0	0	24	4	48	24	48	24
24	33060	Boiler & Compressor House	0	0	9	0	21	12	21	9
25	33530	Fill and Press (packout areas only)	83	73	0	0	0	0	0	0
26	34110	WP Filling	0	0	589	0	1,218	609	1,178	589
27	34120	Ammo Quality (south end only)	36	21	40	14	111	73	94	40
28	34140	Boiler & Compressor House	16	15	10	0	20	10	20	10
29	34910	Admin/FE Maint. Shop	88	81	412	8	1,427	715	846	412
30	34970	Administration	12	4	28	0	96	48	56	28
31	44100	Production Field Office	70	29	218	5	631	344	436	218
32	51420	Offices/DMMD	16	0	118	0	452	227	236	118
33	51430	Engineering Administration	8	4	25	0	82	41	50	25
34	53160	Chemical Administration	5	5	55	4	178	89	110	55
35	60020	Security	26	24	32	4	106	53	66	32
36	60060	Administration	3	3	46	35	178	89	92	46
37	60070	Fixed Laundry	16	17	60	0	126	63	122	60
38	60090	TC Administration	34	33	0	0	0	0	0	0
39	60630	Warehouse	10	16	11	0	26	13	22	11
40	63100	Chemical Field Maint. Shop	16	0	87	2	240	120	174	87
41	63110	Chemical Maint. shop	4	0	75	0	290	145	156	75
42	63120	Chemical Field Maint. Shop	3	2	21	0	56	28	42	21
43	63200	Chemical Field Maint. Shop	0	0	104	14	398	199	344	104
44	63210	Mask Repair	15	0	85	0	170	85	170	85
45	63410	Toxic/Conventional Change House	97	93	55	0	55	55	55	55
		TOTALS	823	641	3,109	270	8,776	4,475	6,464	3,109

BLDG 10-020

Room	Remv Fixt.	Fixt. Type	Install Fixt.	Fixt. Type	Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	Rmv Hldrs.	T8 Lamps	Elect. Blsts.
223-9	0		0		12	4	B1	2	R2	12	48	24	24	24	12
Break	2		0		4	1	H3	2	H2		4	4	8	8	4
106	0		0		4	4	B1	2	WL	4	16	8	8	8	4
107	2		0		8	4	B1	2	R2	8	32	16	16	16	8
202	0		0		4	4	F	2	RR	4	16	8	8	8	4
206	0		0		6	4	B1	2	WL	6	24	12	12	12	6
288	1		0		6	4	B1	2	WL	6	24	12	12	12	6
Hall	4	M3	5	CF											
Vending	3	M4	2	I2											
101	4	M3	4	R2											
103	4	M3	4	R2											
205	7	M3	7	R2											
217	4	M3	4	R2											
265	4	M3	4	R2											
270	6	M3	3	R2											
289	2	A	1	SM											
Cashier	3	M3	1	W2											
215	6	M3	6	W2											
263	5	M3	2	W2											
290	18	M3	10	W2											
201-3	6	M3	5	WL											
213-16	7	M3	7	WL											
286B	3	M3	3	WL											
292A	4	M3	4	WL											
Cashier			2	WL											
100	4	M3	4	WL											
112	6	M3	4	WL											
115	6	M3	4	WL											
117	6	M3	4	WL											
207	4	M3	4	WL											
209	4	M3	4	WL											
221	4	M3	4	WL											
228	2	M3	2	WL											
231	2	M3	3	WL											
232	10	M3	10	WL											
263			3	WL											
266	8	M3	8	WL											
267	4	M3	4	WL											
269	6	M3	6	WL											
270			3	WL											
282	4	M3	4	WL											
284	2	M3	2	WL											
292	2	M3	2	WL											
Totals	169		149		44					40	164	84	88	88	44

164	M3		4L Turret Strip/ Eggcrate Louvers
3	M4		2L Turret Strip/ Eggcrate Louvers
2	A		2L Ceiling Mount Wraparound
		5 CF	Compact Fluorescent
		2 I2	2L Industrial
		26 R2	2L Wraparound w/ reflector
		1 SM	1L Surface Strip
		19 W2	2L Wraparound
		96 WL	2L Wraparound w/ reflector

BLDG 10-030

Room		Rmv Fixt.	Fixt. Type	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Toilets		2	G2	2	M8												
Open Office							8	4	P4	4	P8		32	16	0	32	8
Janitor		1	R1				1	2	R1	1	R		2	1	2	1	1
S. Foyer							1	4	R4	1	R		4	2	2	1	1
Computer							1	4	R4	3	R3		4	2	2	3	1
Off. 2 & 3							4	4	P4	3	R3		16	8	8	12	4
Off. 4 & 5							4	4	P4	3	R3		16	8	8	12	4
Office 6							2	4	P4	3	R3		8	4	4	6	2
Office 8							2	4	P4	3	R3		8	4	4	6	2
Break							2	2	R2	2	R8		4	2	0	4	2
E. Hall							2	2	R2	2	R8		4	2	0	4	2
Hall							4	4	P4	2	R8		16	8	8	8	4
Hall/Off							3	2	R2	2	R8		6	3	0	6	3
Storage							1	2	R2	2	R8		2	1	0	2	1
Storage							1	4	P4	2	R8		4	2	2	2	1
Conf.							2	4	R4	2	RR	2	8	4	4	4	2
File Rm							4	4	P4	2	RR	4	16	8	8	8	4
Hall/Off							2	4	P4	2	RR	2	8	4	4	4	2
Office 1							2	4	P4	2	RR	2	8	4	4	4	2
Office 7							3	2	P2	2	RR	3	6	3	6	6	3
Open Off 2							8	4	R4	2	RR	8	32	16	16	16	8
Toilets							6	2	SM	1	S1		12	6	12	6	6
E. Ent.							1	2	S2	2	S8		2	1	0	2	1
Entrance							2	2	S2	2	S8		4	2	0	4	2
Hall		1	S2				1	2	S2	2	S8		2	1	0	2	1
Totals		4		2			67					21	224	112	94	155	67

2	G2		2L Wet Location
1	R1		1X4 2L Troffer
1	S2		2X2 2L troffer
		2 M8	1X4 2L Surface Strip

BLDG 10-050

Room		Rmv Fixt.	Fixt. Type	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Entrance		2	L4				2	4	L4	2	LR	2	8	4	4	4	2
Office 1							4	4	L4	2	LR	4	16	8	8	8	4
Office 2							4	4	L4	2	LR	4	16	8	8	8	4
Hallway 1							5	2	R2	2	L8		10	5	0	10	5
Hallway 2							4	2	R2	2	L8		8	4	0	8	4
Kitchen							5	2	L2	2	LR	5	10	5	0	10	5
Lounge							4	2	R2	2	L8		8	4	0	8	4
Exercise Rm.							6	2	R2	2	L8		12	6	0	12	6
Laundry							2	2	R2	2	L8		4	2	0	4	2
Toilet/Shwr		4	L2	4	W8												
Sleeping							3	2	R2	2	L8		6	3	0	6	3
TV Room							4	4	L4	2	L8		16	8	8	8	4
Office 3							2	4	L4	2	LR	2	8	4	4	4	2
Women's RR							1	4	L4	2	L8		4	2	2	2	1
Totals		6		4			46					17	126	63	34	92	46

2	L4	2X4 4L Troffer
4	L2	1X4 2L Wraparound
4	W8	2L Ceiling Mounted Wraparound

BLDG 13-010

Room		Remove Fixt.	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Admin Offices						20	4	L4	2	LR	2	80	40	40	40	20
Training						4	4	L4	2	L8		16	8	8	8	4
Hallway						4	2	L2	2	L8		8	4	0	8	4
Totals		0	0			28					2	104	52	48	56	28

BLDG 13-020

Room		Remov Fixt.		Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Waiting							4	2	A1	2	A8		8	4	0	8	4
Entrance							2	2	M4	2	S8		4	2	0	4	2
Reception							3	2	M4	2	S8		6	3	0	6	3
Records							4	2	M4	2	S8		8	4	0	8	4
Office 1							4	2	M4	2	SR	4	8	4	0	8	4
Dr. Office		3	M4	4	BR								0	0	0	0	0
Dr. Office		1	B1														
Exam Room							2	2	M4	2	SR	2	4	2	0	4	2
Patient Lobby							1	2	T	2	T8		2	1	0	2	1
Hallway 1		1	M3	1	T8								0	0	0	0	0
Hallway 1		1	T2														
Hallway 1		2	X5	2	GC								0	0	0	0	0
X-Ray Room							2	4	T2	2	TR	2	8	4	2	4	2
X-Ray Tech		1	M3	1	BR								0	0	1	0	0
X-Ray Wait		1	M3	1	BR								0	0	1	0	0
Records							2	2	M4	2	S8		4	2	0	4	2
Hallway 2		2	M3	2	A8								0	0	2	0	0
Scrub Room							2	4	T2	2	TR	2	8	4	2	4	2
Emergency							4	4	T2	4	T4		16	8	0	16	4
Med. Storage							3	4	T2	2	TR	3	12	6	3	6	3
ER Entrance							1	2	J	2	J8		2	1	0	2	1
Totals		12		11			34					13	90	45	11	76	34

5	M3	4L Strip/ Eggcrate Louvers
2	X5	75W Incandescent
1	T2	4L surface mount
1	B1	4L Wraparound
3	M4	2L Surface Strip
6	BR	4' Wraparound w/ reflector
1	T8	2X4 2L Surface Mount w/ Acrylic Lens
2	GC	20w Compact quad
2	A8	2L Ceiling Mount Wraparound

BLDG 13-030

Room		Remove Fixt.	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Operations						3	4	T2	2	TR	3	12	6	6	6	3
Clerk						1	4	T2	4	T4		4	2	0	4	1
Commander						1	4	T2	4	T4		4	2	0	4	1
Security						1	2	T	2	T8		2	1	0	2	1
Supervisor						1	4	T2	4	T4		4	2	0	4	1
Publications						1	4	T2	4	T4		4	2	0	4	1
Latrine						1	2	T	2	T8		2	1	0	2	1
Equipment						1	2	T	2	T8		2	1	0	2	1
Laundry						1	2	T	2	T8		2	1	0	2	1
Maintenance						1	4	T2	4	T4		4	2	0	4	1
Supply Sto.						1	2	T	2	T8		2	1	0	2	1
Supply Office						1	4	T2	4	T4		4	2	0	4	1
Dress Out Rm						1	2	T	2	TR	1	2	1	0	2	1
Classroom						3	4	T2	4	T4		12	6	0	12	3
Class Office						1	4	T2	4	T4		4	2	0	4	1
Kitchen						2	4	T2	4	T4		8	4	0	8	2
Work room						1	2	T	2	TR	1	2	1	0	2	1
Tool Room						1	2	T	2	T8		2	1	0	2	1
Hallway						2	4	T2	2	TR	2	8	4	~~8~~ 4	4	2
Totals		0	0			25					7	84	42	~~84~~ 80	74	25

BLDG 13-040

Room		Remov Fixt.		Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Room 1							2	2	A1	2	A8		4	2	0	4	2
Room 2							2	2	A1	2	A8		4	2	0	4	2
Room 3							4	2	P2	2	P8		8	4	0	8	4
Room 4							2	2	P2	2	P8		4	2	0	4	2
Room 5							2	2	P2	2	P8		4	2	0	4	2
Room 6							3	2	P2	2	P8		6	3	0	6	3
Room 7		1	X2	1	CF		2	2	P2	2	P8		4	2	0	4	2
Room 8							3	2	P2	2	P8		6	3	0	6	3
Room 9		1	P2				2	2	P2	2	P8		4	2	0	4	2
Men's Toilet							1	2	P2	2	P8		2	1	0	2	1
Women's Toilet							1	2	P2	2	P8		2	1	0	2	1
Hallway		3	P2				2	2	P2	2	P8		4	2	0	4	2
Totals		5		1			26					0	52	26	0	52	26

1	X2	75W Incandescent
4	P2	2X4 2L Troffer
1	CF	20 w Compact Fluorescent

BLDG 13-060

Room		Remove Fixt.	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Supervisor						2	4	F	2	FR	2	8	4	4	4	2
Eye Exam						3	4	F	2	FR	3	12	6	6	6	3
Toilet						1	4	F	2	F2		4	2	2	2	1
Store Rm 1						1	4	F	2	F2		4	2	2	2	1
Office 1						3	4	F	2	F2		12	6	6	6	3
Reception						3	4	F	2	F2		12	6	6	6	3
Office 2						2	4	F	2	F2		8	4	4	4	2
Hallway		3				2	4	F	2	F2		8	4	4	4	2
Totals		3	0			17					5	68	34	34	34	17

BLDG 13-080

Room		Remov Fixt.		Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Lab 1		5	M3	7	BR								0	0	0	0	0
		2	XX														
Lab 2		3	M3	3	BR								0	0	0	0	0
Urinalysis		2	M3	2	BT								0	0	0	0	0
Vini-Punct.							2	4	B1	4	B4		8	4	0	8	2
Office		2	M3	2	BT								0	0	0	0	0
Toilets		6	XY	6	CF								0	0	0	0	0
Hallway		1	XY	1	CF								0	0	0	0	0
Totals		21		21			2					0	8	4	0	8	2

11	M3		4L Eggcrate Louvers
2	XX		100 W Incandescent
7	XY		75 W Incandescent
		10 BR	4' 2L Acrylic Wraparound w/ Reflector
		4 BT	4' 2L Acrylic Wraparound w/ Reflector
		7 CF	~~48~~ 20 W Quad Compact Fluorescent

BLDG 13-100

Room		Remove Fixt.	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Waiting						6	2	A2	2	A8		12	6	0	12	6
Pharmacy						2	4	B2	4	B8		8	4	0	8	2
Phar. Office						1	4	B2	4	B8		4	2	0	4	1
Storage						1	4	B2	2	A8		4	2	2	2	1
Hallway						3	2	A2	2	A8		6	3	0	6	3
Storage 2		2	2	A8		1	2	A2	2	A8		2	1	0	2	1
Mechanical						1	2	A2	2	A8		2	1	0	2	1
Totals		2	2			15					0	38	19	2	36	15

2 A8 4' Acrylic Lens Wraparound

BLDG 13-110

Room		Remove Fixt.	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Admin. Area		1	1	CF		5	4	L4	4	L5		20	10	0	20	5
Admin. Area		4				8	4	L4	2	L8		32	16	16	16	8
Admin. Area						16	2	L2	2	L8		32	16	0	32	16
Totals		5	1			29					0	84	42	16	68	29

1 CF ~~18~~ 20 W Quad Compact Fluorescent

BLDGS 16-210, 16-220

Room		Remov Fixt.		Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Hallway		2	G				8	2	G	2	R2		16	8	0	16	8
Hallway		2	G2				2	1	G1	1	R1		2	2	0	2	2
Kitchen							4	2	A1	2	A8		8	4	0	8	4
Latrine 1							2	2	A1	2	A8		4	2	0	4	2
Laundry		2	X1	2	CF		4	1	A2	1	A7		4	4	0	4	4
Shower							2	2	A1	2	A8		4	2	0	4	2
Hallway		10	G	4	R2		4	1	G1	1	R1		4	4	0	4	4
Latrine 2							2	1	A2	1	A7		2	2	0	2	2
Latrine 2							2	2	A1	2	A8		4	2	0	4	2
Totals		16		6			30					0	48	30	0	48	30

12	G	2X4 2L Troffer
2	G2	2X2 2L Troffer
2	X1	150 w Incandescent Fixture
2	CF	2L Surface Round Down Light, Compact Fl.
4	R2	2X4 2L Static Grid Troffer, Acrylic Lens

BLDG 31-010

Room		Remove Fixt.	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Laboratory						6	4	A	4	A8		24	12	0	24	6
Totals		0	0			6					0	24	12	0	24	6

BLDG 31-080

Room		Remove Fixt.	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Foyer						1	2	L2	2	W8		2	1	0	2	1
Foyer						1	4	L4	2	R2		4	2	2	2	1
Breakroom						2	4	L4	2	R2		8	4	4	4	2
Toilets						2	2	L2	2	W8		4	2	0	4	2
TMDE Shop						2	4	L4	4	L8		8	4	0	8	2
Laboratory						8	4	L4	4	L8		32	16	0	32	8
Laboratory						2	4	L4	2	R2		8	4	4	4	2
Office						2	4	L4	2	R2		8	4	4	4	2
Computer						2	4	L4	2	R2		8	4	4	4	2
Radiac Room						2	4	L4	2	R2		8	4	4	4	2
Totals		0	0			24					0	90	45	22	68	24

BLDG 32-030

Room		Remove Fixt.	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Office						4	2	B	2	B8		8	4	0	8	4
Garage		15	22	I8												
Totals		15	22			4					0	8	4	0	8	4

22 I8 8' 2L Industrial

BLDG 32-035

Room		Remove Fixt.	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Motor Pool						252	2	L2	2	L8		504	252	0	504	252
Totals		0	0			252					0	504	252	0	504	252

BLDGS 32-060, 33-060

Room		Remove Fixt.	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Compressor						12	2	A1	2	A8		24	12	0	24	12
Boiler Room						6	3	B1	3	B8		18	9/12	0	18	6
Totals		0	0			18					0	42	21/24	0	42	18

BLDG 32-070

Room		Remove Fixt.	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Laundry						53	2	A	2	A8		106	53	0	106	53
Folding						43	2	A	2	A8		86	43	0	86	43
Break Room		1 A				2	2	A	2	A8		4	2	0	4	2
Toilets						2	2	A	2	A8		4	2	0	4	2
Office						3	4	C	4	C8		12	6	0	12	3
Totals		1	0			103					0	212	106	0	212	103

BLDG 32-090

Room		Remove Fixt.	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Office 1						4	4	B	2	BR	4	16	8	8	8	4
Hallway						1	4	A	2	A2		4	2	2	2	1
Hallway 2						1	4	A	2	A2		4	2	2	2	1
Restrooms						2	4	A	2	A2		8	4	4	4	2
Office 2						15	4	A	2	A2		60	30	30	30	15
Office 3						1	4	A	4	A4		4	2	0	4	1
File Room						2	4	A	2	BR	2	8	4	4	4	2
Office 4						6	4	A	2	BR	6	24	12	12	12	6
Office 5						4	4	A	2	BR	4	16	8	8	8	4
Office 6						8	4	A	2	BR	8	32	16	16	16	8
Breakroom						8	4	A	2	A2		32	16	16	16	8
Conference						6	4	C	2	W2		24	12	12	12	6
Men's Room						2	4	A	2	A2		8	4	4	4	2
Totals		0	0			60					24	240	120	118	122	60

BLDG 32-100

Room		Remove Fixt.	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Office 1						6	4	A1	3	A3		24	12	12	18	6
Office 2						3	4	A1	2	AR	3	12	6	6	6	3
Break Room						3	4	A1	2	A8		12	6	6	6	3
Men's Toilet						1	2	B1	2	BT		2	1	0	2	1
Men's Toilet						2	2	B2	2	BS		4	2	0	4	2
Women's Toilet						1	2	B1	2	BT		2	1	0	2	1
Women's Toilet						1	2	B2	2	BS		2	1	0	2	1
Entrance						3	2	C	2	C8		6	3	0	6	3
Storage 1						4	2	D	2	D8		8	4	0	8	4
Laboratory						3	2	C	2	C8		6	3	0	6	3
Laboratory						42	4	A2	2	S2		168	84	84	84	42
Lab Hallway		3				2	4	A2	2	S2		8	4	4	4	2
Elect. Test						3	4	A2	4	A4		12	6	0	12	3
Storage 2						3	2	D	2	D8		6	3	0	6	3
Training						6	4	A1	2	A8		24	12	12	12	6
Rebuild Shop						8	2	E1	2	E8		16	8	0	16	8
Rebuild Shop						11	4	G1	2	E8		44	22	22	22	11
Rebuild Shop						12	2	F1	2	F8		24	12	0	24	12
Rebuild Shop						21	4	G1	2	E8		84	42	42	42	21
Totals		3	0			135					3	464	232	188	282	135

BLDG 32-130

Room		Remov Fixt.		Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Laboratory							21	4	A1	2	AR	21	84	42	42	42	21
Sub Lab							17	4	A1	2	AR	17	68	34	34	34	17
Restroom		2	B2	2	CF								0	0	0	0	0
Storage		1	C1				1	2	C1	2	C8		2	1	0	2	1
Testing							10	4	A1	2	AR	10	40	20	20	20	10
Totals		3		2			49					48	194	97	96	98	49

2	B2		100W Incandescents
1	C1		2L Wraparound
		2 CF	28w Screw-in Compact fluorescent

BLDG 32-150

Room		Remove Fixt.	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Office 1						4	2	A1	2	A8		8	4	0	8	4
Office 2						4	2	A1	2	A8		8	4	0	8	4
Office 3						4	2	A1	2	A8		8	4	0	8	4
Office 4						4	2	A1	2	A8		8	4	0	8	4
Office 5						4	2	A1	2	AR	4	8	4	0	8	4
Restroom 1						1	2	A1	2	A8		2	1	0	2	1
Restroom 2						1	2	A1	2	A8		2	1	0	2	1
Restroom 3						2	2	A1	2	A8		4	2	0	4	2
Totals		0	0			24					4	48	24	0	48	24

BLDG 33-530

Room		Remove Fixt.	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
North End		41	28	I4								0	0	0	0	0
South End		30	30	I4								0	0	0	0	0
NE Corner		12	15	I4								0	0	0	0	0
Totals		83	73			0					0	0	0	0	0	0

73 I4 1X4 2L Industrial

BLDG 34-110

Room		Remove Fixt.	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
WP Packing						113	2	A1	2	A8		226	113	0	226	113
WP Packing						4	4	B1	2	A8		16	8	8	8	4
Paint Shop						10	2	C1	2	C8		20	10	0	20	10
Packing Office						6	4	E	2	A8		24	12	12	12	6
Prep Room						40	2	A1	2	A8		80	40	0	80	40
Production Lin						46	2	A1	2	A8		92	46	0	92	46
Filling						360	2	A1	2	A8		720	360	0	720	360
Filling						6	4	E	2	A8		24	12	12	12	6
Office						4	4	F	2	A8		16	8	8	8	4
Totals		0	0			589					0	1218	609	40	1178	589

BLDG 34-120

Room		Remove Fixt.	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Office 1						8	3	R2	2	RR	8	24	16	16	16	8
Office 2						2	3	R2	2	RR	2	6	4	4	4	2
Hallway		3	2	I2								0	0	0	0	0
Office 4		15	16	I2								0	0	0	0	0
Storage		14	3	I2								0	0	0	0	0
Break Room		1				2	2	R3	2	R8		4	2	0	4	2
Toilets/Foyer						2	1	B	1	B8		2	2	0	2	2
Toilets/Foyer						3	2	R3	2	R8		6	3	0	6	3
Laboratory						16	3	A1	3	A8		48	32	0	48	16
Office 3						4	3	R1	2	RR	4	12	8	8	8	4
Office 4		3				3	3	R2	2	R8		9	6	6	6	3
Totals		36	21			40					14	111	73	34	94	40

21 I2 1X4 2L Industrial

BLDG 34-140

Room		Remove Fixt.	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Office						2	2	A1	2	A8		4	2	0	4	2
Water Test		2	1	A8								0	0	0	0	0
Boiler		2	2	C8		6	2	C	2	C8		12	6	0	12	6
Boiler		4	4	CF												
Restroom						2	2	C	2	C8		4	2	0	4	2
Compressor 1		4	4	A8								0	0	0	0	0
Compressor 2		4	4	A8								0	0	0	0	0
Totals		16	15			10					0	20	10	0	20	10

9	A8	1X8 2L Industrial
2	C8	1X4 2L Industrial
4	CF	28W Screw-in Compact Fluorescent Replaces 100W Incandescent

34910
BLDG 34-140

Room	Remove Fixt.	Install Fixt.	Fixt. Type	Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	Rmv. Hldrs.	T8 Lamps	Elect. Blsts.
Change Rm 2				15	2	A	2	A8		30	15	0	30	15
Change Rm 1				7	2	A	2	A8		14	7	0	14	7
Paint Shop	8	8	MH							0	0	0	0	0
Sign Shop	22	18	I8							0	0	0	0	0
Entomology	2	8	I8							0	0	0	0	0
Paint Office	4	4	I8							0	0	0	0	0
Toilet 2				8	2	A	2	A8		16	8	0	16	8
Toilet 1				4	2	A	2	A8		8	4	0	8	4
PM Conf.				4	4	F	2	G8		16	8	16	8	4
PM Hall	1			1	4	F	2	G8		4	2	4	2	1
PM Office 1				4	4	F	2	G8		16	8	16	8	4
PM Office 2				4	4	F	2	G8		16	8	16	8	4
PM Office 3				4	4	F	2	G8		16	8	16	8	4
WO Central				8	4	B	4	B8		24	12	0	24	6
WO Central Ad				2	4	B	4	B8		8	4	0	8	2
WO Offices 1,2				4	2	G	2	G8		8	4	0	8	4
WO Hall				1	2	A	2	A8		2	1	0	2	1
WO Office 3				4	2	G	2	G8		8	4	0	8	4
WO Copy				2	4	F	2	G8		8	4	8	4	2
WO Break	2			4	4	F	2	G8		16	8	16	8	4
WO Secretary				8	4	F	2	G8		32	16	32	16	8
WO Sec. Alcove				2	4	F	2	G8		8	4	8	4	2
WO Microfiche	2			4	2	G	2	G8		8	4	0	8	4
Microf. Storage	1			1	2	G	2	G8		2	1	0	2	1
Util. Break	2			2	4	B	2	A8		8	4	8	4	2
Util. Kitchen	2	1	A8							0	0	0	0	0
Util. Office	2	2	A8							0	0	0	0	0
Women Change				8	2	A	2	A8		16	8	0	16	8
Hall/Change 1	1	2	I1							0	0	0	0	0
Grnds/Maint.	1	1	A8	3	4	B	2	A8		12	6	12	6	3
Refrig. Shop				9	4	M	2	M8		36	18	36	18	9
Refrg. Hall	3	1	M8	2	4	M	2	M8		8	4	8	4	2
Elec. Shop Brk.	3	3	L8	3	2	L1	2	L8		6	3	0	6	3
El Shop Hall 1				1	3	L2	2	L8		3	2	2	2	1
El Shop Hall 2	1			1	2	L1	2	L8		2	1	0	2	1
El Shop Work				4	2	L1	2	L8		8	4	0	8	4
Elec Office 1	2	2	L8	2	2	L1	2	L8		4	2	0	4	2
Elec Parts	2	2	L8							0	0	0	0	0
Locksmith	1			2	3	L4	2	L8		8	4	4	4	2
Locksmith				3	4	L	2	LR	3	12	6	12	6	3
Locksmith				2	2	L3	2	LR	2	4	2	0	4	2
Inst. Shop Brk		1	L8	3	4	L	2	L8		12	6	12	6	3
Inst Entrance		1	L8	3	4	L	2	L8		12	6	12	6	3
Inst Shop Office				4	4	F	2	G8		16	8	16	8	4
Wash Area				2	4	L	2	L8		8	4	8	4	2
Millwright Ent. 1	2			3	2	C3	2	C8		6	3	0	6	3
Inst Shop Work		1	LR	3	4	L	2	LR	3	12	6	12	6	3
Millwright Ent. 2				2	4	C	2	C8		8	4	8	4	2
Millwright Office				4	4	L	2	L8		16	8	16	8	4
Millwright Stor				3	4	L	2	L8		12	6	12	6	3
Millwright Shop	3	3	L8	11	4	L	2	L8		44	22	44	22	11
Millwright Shop	2	5	L8	3	4	L	2	L8		12	6	12	6	3
Tool/Die Lunch				12	4	F	2	G8		48	24	48	24	12
Tool & Die 1				47	4	C	2	C8		188	94	188	94	47
Tool & Die 2				67	4	C	2	C8		268	134	268	134	67
Tool & Die 3				50	4	C	2	C8		200	100	200	100	50
Tool & Die Sto	1	1	L8	2	4	C	2	C8		8	4	8	4	2
Tool & Die Sto				1	2	C1	2	C8		2	1	0	2	1
Tool & Die Sto				2	4	L	2	L8		8	4	8	4	2
Tool & Die Ofc	2			6	4	L	2	L8		24	12	24	12	6
Tool Room				3	4	B1	4	B8		12	6	0	12	3
Tool Room				14	2	C3	2	C8		28	14	0	28	14
Tool Hallway				2	4	C	2	C8		8	4	8	4	2
BGU Work Area	4	6	AR							0	0	0	0	0
BGU Break	1			2	4	B1	2	A8		8	4	8	4	2
BGU Office 1	2	4	AR							0	0	0	0	0
BGU Office 2	4	4	AR							0	0	0	0	0
BGU Entrance				1	4	L	2	L8		4	2	4	2	1
BGU Kitchen	2	2	A8							0	0	0	0	0
Sheet Metal	3	3	L8	8	4	C	2	C8		32	16	32	16	8
Sheet Metal				5	2	C1	2	C8		10	5	0	10	5
Storage Crib				18	2	C3	2	C8		36	18	0	36	18
Totals	88	81		412					8	1427	715	1162	848	412

8	MH	100 W Metal Halide
21	L8	1X4 2L Industrial
6	A8	1x4 2L Wraparond
14	AR	1x4 2L Wraparond w/ Reflector
2	I1	1x4 1L Industrial
1	M8	1x8 2L Industrial
28	I8	1X4 2L Industrial REFLECTOR
1	LR	1X4 2L Industrial w/ ~~Wraparound~~

BLDG 34-970

Room		Remv Fixt.	Fixt. Type	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Secretary		1	F				3	4	F	2	G8		12	6	6	6	3
Admin Office							4	4	F	2	G8		16	8	8	8	4
Admin 4		1	F				3	4	F	2	G8		12	6	6	6	3
Admin 3							4	4	F	2	G8		16	8	8	8	4
Director		4	G				4	2	G	2	G8		8	4	0	8	4
Conf. Room		1	F				4	4	F	2	G8		16	8	8	8	4
File Room		1	F				1	4	F	2	G8		4	2	2	2	1
Copier room		2	M3	2	W8								0	0	0	0	0
Women's Lounge							1	4	B	2	W8		4	2	2	2	1
Restrooms		2	X2	2	CF								0	0	0	0	0
Alcove							1	2	G	2	G8		2	1	0	2	1
Kitchen							1	2	G	2	G8		2	1	0	2	1
Hallway							2	2	G	2	G8		4	2	0	4	2
Totals		12		4			28					0	96	48	40	56	28

2 W8 4' 2L Wraparound
2 CF Compact Fluorescent replaces 75W Incamd. Screw-in

BLDG 44-100

Room	Remv. Fixt.	Fixt. Type	Install Fixt.	Fixt. Type	Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	Rmv. Hldrs.	T8 Lamps	Elect. Blsts.
Cafeteria	10	F1			54	3	F1	2	F8		162	108	108	108	54
Cafeteria					3	3	F2	2	F8		9	6	6	6	3
Cafeteria Office	2	F			6	4	F	2	F8		24	12	24	12	6
Cafeteria Conf	2	F			2	4	F	2	F8		8	4	8	4	2
Cafeteria Office	1	F1			3	4	F	2	F8		12	6	12	6	3
Hall & Toilets	5	X	5	CF							0	0	0	0	0
Engr./PM Offices					2	4	F	2	FR	2	8	4	8	4	2
PM Admin Area					9	4	F	2	F8		36	18	36	18	9
PM Director					4	4	F	2	F8		16	8	16	8	4
Coffee Room					2	4	F	2	F8		8	4	8	4	2
CADD Office					2	4	F	2	F8		8	4	8	4	2
Office 1					3	4	F	2	FR	3	12	6	12	6	3
Office 2					4	4	F	2	F8		16	8	16	8	4
Office Hall					2	4	F	2	F8		8	4	8	4	2
Main Hall	1	X	1	CF	7	2	G	2	F8		14	7	0	14	7
Main Toilets	2	X	2	CF							0	0	0	0	0
Office 3					5	4	F	2	F8		20	10	20	10	5
Men's New LR					13	2	G	2	F8		26	13	0	26	13
LR Alcove					1	2	G	2	F8		2	1	0	2	1
Men's New Shwr	1	G			4	2	G	2	F8		8	4	0	8	4
Men's New Shwr					2	2	W1	2	W8		4	2	0	4	2
Men's Old LR					36	2	G	2	F8		72	36	0	72	36
Locker Hall	8	M4	4	W2							0	0	0	0	0
Locker Hall	1	X									0	0	0	0	0
Locker Toilets	8	M4	4	W2							0	0	0	0	0
Men's Old Shwr					4	2	J	2	J8		8	4	0	8	4
Women's LR	2	J			6	2	J	2	J8		12	6	0	12	6
Women Shwr 1	14	X1	5	J8							0	0	0	0	0
Women Shwr 2	10	X1	3	J8							0	0	0	0	0
Women Shwr 2			2	CF							0	0	0	0	0
Women's Lounge					4	2	G	2	F8		8	4	0	8	4
Lounge RR	3	M4	3	W2							0	0	0	0	0
Supply Storage					8	2	G	2	F8		16	8	0	16	8
Supply Filing					23	4	F	2	F8		92	46	92	46	23
Supply Office					2	4	F	2	F8		8	4	8	4	2
Supply Office					7	2	G	2	F8		14	7	0	14	7
Totals	70		29		218					5	631	344	390	436	218

11	W2	4' 2L Ceiling Mount Wraparound
10	CF	PS20 Screw-in Compact Fluorescent
8	J8	4' 2L Ceiling Mount Wraparound Wet Location

BLDG 51-420

Room		Remv. Fixt.	Fixt. Type	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	Rmv. Hldrs.	T8 Lamps	Elect. Blsts.
Room 34		3	F				3	4	F	2	F8		12	6	12	6	3
Room 35							4	4	F	2	F8		16	8	16	8	4
Room 33							4	4	F	2	F8		16	8	16	8	4
Room 31		2	F				4	4	F	2	F8		16	8	16	8	4
Room 29							4	4	F	2	F8		16	8	16	8	4
Room 32		2	J2				3	2	J2	2	J8		6	3	0	6	3
Room 32							1	2	W	2	W8		2	1	0	2	1
Room 30		1	J2				2	2	J2	2	J8		4	2	0	4	2
Room 30							1	2	W	2	W8		2	1	0	2	1
Room 27							4	4	F	2	F8		16	8	16	8	4
Room 21							4	4	F	2	F8		16	8	16	8	4
Room 25							4	4	F	2	F8		16	8	16	8	4
Room 22							4	4	F	2	F8		16	8	16	8	4
Room 23							4	4	F	2	F8		16	8	16	8	4
Room 20-24		1	F				3	4	F	2	F8		12	6	12	6	3
Room 26							4	4	F	2	F8		16	8	16	8	4
Room 28							4	4	F	2	F8		16	8	16	8	4
Men Toilet		2	F				2	4	F	2	F8		8	4	8	4	2
Women Toilet		1	F				1	4	F	2	F8		4	2	4	2	1
Women Toilet							1	2	L3	2	L8		2	1	0	2	1
Women Toilet							1	2	W	2	W8		2	1	0	2	1
Copier Room							2	3	L2	2	L8		6	4	4	4	2
Room 5							6	4	F	2	F8		24	12	24	12	6
Room 3		2	F				4	4	F	2	F8		16	8	16	8	4
Room 1							6	4	F	2	F8		24	12	24	12	6
Room 2							2	4	F	2	F8		8	4	8	4	2
Room 4		2	F				4	4	F	2	F8		16	8	16	8	4
Rooms 6,8,10							12	4	F	2	F8		48	24	48	24	12
Room 9							2	4	F	2	F8		8	4	8	4	2
Room 12							4	4	F	2	F8		16	8	16	8	4
Room 11							4	4	F	2	F8		16	8	16	8	4
Room 14							6	4	F	2	F8		24	12	24	12	6
Room 13							4	4	F	2	F8		16	8	16	8	4
Totals		16		0			118					0	452	227	432	236	118

BLDG 51-430

Room		Remv Fixt.	Fixt. Type	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Office 1		1	F				8	4	F	2	F8		32	16	16	16	8
Office/Shop							8	2	H	2	H8		16	8	0	16	8
Restrooms		2	X2	2	CF								0	0	0	0	0
Conference		3	G				6	4	F	2	F8		24	12	12	12	6
Office 3							2	4	F	2	F8		8	4	4	4	2
Office 3							1	2	G	2	F8		2	1	0	2	1
Office 3 Toilet		2	X3	2	CF								0	0	0	0	0
Totals		8		4			25					0	82	41	32	50	25

1	F		2X4 4L Troffer
3	G		2X4 2L Troffer
2	X2		75W Incandescent
2	X3		60W Incandescent
		4 CF	PS20 Screw-in Compact Fluorescent

BLDG 53-160

Room		Remv Fixt.	Fixt. Type	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Main Admin							16	4	F	2	F2		64	32	32	32	16
Break Room							9	2	G	2	F2		18	9	0	18	9
Women's Change		4	X_	4	CF		2	4	F	2	F2		8	4	4	4	2
Women's Change							4	2	G1	2	G8		8	4	0	8	4
Women's Change							1	2	Y	2	W8		2	1	0	2	1
Office 3							4	4	F	2	FR	4	16	8	8	8	4
Store Room							2	4	F	2	F2		8	4	4	4	2
Men's Change		1	X_	1	CF		9	4	F	2	F2		36	18	18	18	9
Men's Change							1	2	G1	2	G8		2	1	0	2	1
Men's Change							2	2	Y	2	W8		4	2	0	4	2
Restrooms							2	2	G1	2	G8		4	2	0	4	2
Restrooms							2	2	Y	2	W8		4	2	0	4	2
Hallway							1	4	F	2	F2		4	2	2	2	1
Totals		5		5			55					4	178	89	68	110	55

4 X_ Incandescent Lamps

5 CF PS23 Compact Fluorescent Screw-in Lamps

BLDG 60-020

Room		Remv Fixt.	Fixt. Type	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Provost Marshall		4	M3,5	4	W8								0	0	0	0	0
Security Spec.		4	M3,5	4	W8								0	0	0	0	0
Room 103		2	M3	2	W4								0	0	0	0	0
Room 105							4	2	A1	2	WR	4	8	4	0	8	4
Room 105A		2	M5	2	WR								0	0	0	0	0
Room 107		2	M5	2	WR								0	0	0	0	0
Room 102		4	M5	2	WR								0	0	0	0	0
Room 104		2	M3,5	2	WR								0	0	0	0	0
Break Room		2	M5	2	W8								0	0	0	0	0
Toilets		1	J	1	W8		1	2	A1	2	W8		2	1	0	2	1
Hallway							9	4	B1	2	W8		36	18	18	18	9
Training							4	2	G	2	G8		8	4	0	8	4
Locker Room 1							2	4	F	2	G8		8	4	4	4	2
Foyer							1	2	G	2	G8		2	1	0	2	1
Room 109		3	M3	3	WR								0	0	0	0	0
Room 110							2	4	F	3	F3		8	4	4	6	2
Radio Room							3	4	F	2	G8		12	6	6	6	3
Radio Room							1	2	G	2	G8		2	1	0	2	1
Locker Room 2							5	4	F	2	G8		20	10	10	10	5
Totals		26		24			32					4	106	53	42	66	32

25	M3,5	4' Surface strip, Eggcrate Louvers
1	J	4' Wraparound, Wet location
11	WR	4' 2L Wraparound w/ Reflector
2	W4	4' 4L Wraparound
11	W8	4' 2L Wraparound

BLDG 60-060

Room		Remv Fixt.	Fixt. Type	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	New Hldrs.	T8 Lamps	Elect. Blsts.
Break Room							6	4	F	2	F2		24	12	12	12	6
Hallway							1	2	A1	2	W2		2	1	0	2	1
Mens Toilet		1	Y1	1	CF		1	4	F	2	F2		4	2	2	2	1
Womens Toilet							1	4	F	2	F2		4	2	2	2	1
Janitor		1	Y1	1	CF								0	0	0	0	0
Room 6							2	4	F	2	FR	2	8	4	4	4	2
Open Office							9	4	F	2	FR	9	36	18	18	18	9
Room 5							2	4	F	2	FR	2	8	4	4	4	2
Room 6A							2	4	F	2	FR	2	8	4	4	4	2
Storage							1	2	A1	2	W2		2	1	0	2	1
Room 3							4	4	F	2	FR	4	16	8	8	8	4
Open Area							9	4	F	2	FR	9	36	18	18	18	9
Room 2							3	4	F	2	FR	3	12	6	6	6	3
Room 1							4	4	F	2	FR	4	16	8	8	8	4
Entrance Hall		1	Y1	1	CF		1	2	A1	2	W2		2	1	0	2	1
Totals		3		3			46					35	178	89	86	92	46

3 Y1 Incandescent Lamps

3 CF PS20 Compact Fluorescent Lamps

BLDG 60-070

Room		Remv Fixt.	Fixt. Type	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	Remv Hldrs.	T8 Lamps	Elect. Blsts.
Cotton Storage		2	C										0	0	0	0	0
Cotton Storage		4	J	6	I8												
Offices		4	J	6	I8								0	0	0	0	0
Showers							4	2	J	2	J8		8	4	0	8	4
Mens Locker		2	J	2	I8								0	0	0	0	0
Hallway		2	J	2	I8								0	0	0	0	0
Mens Toilet		2	J	1	I8								0	0	0	0	0
Repair Station							1	4	C	4	C8		4	2	0	4	12
Repair Station							2	4	C2	2	C1		8	4	4	4	2
Repair Station							51	2	J	2	J8		102	51	0	102	51
Control Room							2	2	J	2	J8		4	2	0	4	2
Totals		16		17			60					0	126	63	4	122	6061

2	C			8' 4L Industrial
14	J			4' 2L Wraparound Wet Location
		17	I8	4' 2L Industrial

BLDG 60-090

Room		Remv Fixt.	Fixt. Type	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	Remv Hldrs.	T8 Lamps	Elect. Blsts.
Main Office		12	M3	12	IR								0	0	0	0	0
Office 2		3	M3	3	IR								0	0	0	0	0
Office 3		2	M3	2	IR								0	0	0	0	0
File Storage		7	M3	7	I8								0	0	0	0	0
Kitchen		2	M3	2	I8								0	0	0	0	0
Hall/Entrance		3	M3	2	I8								0	0	0	0	0
Womens Toilet		2	ZX	2	C4								0	0	0	0	0
Womens Toilet		1	ZY	1	CF								0	0	0	0	0
Mens Toilet		1	ZX	1	C4								0	0	0	0	0
Mens Toilet		1	ZY	1	CF								0	0	0	0	0
Totals		34		33			0					0	0	0	0	0	0

29	M3	4' 4L Turret Strip Eggcrate Louvers
3	ZX	2L Incandescent Fixtures, replace lamps
2	ZY	Incandescent Lamp
17	IR	1X4 2L Industrial / Eggcrate Louvers / Reflectors
11	I8	1X4 2L Industrial / Eggcrate Louvers
3	C4	(2) PS15 Compact Lamps
2	CF	PS20 Compact Lamp

BLDG 60-630

Room		Remv Fixt.	Fixt. Type	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	Remv Hldrs.	T8 Lamps	Elect. Blsts.
Shipping		9	XP	15	H8								0	0	0	0	0
Break Room							2	4	F1	2	F8		8	4	4	4	2
Womens Toilet							2	2	J	2	H8		4	2	0	4	2
Mens Change		1	XQ	1	CQ		3	2	J	2	H8		6	3	0	6	3
Storage							1	2	J	2	H8		2	1	0	2	1
Office							3	2	J	2	H8		6	3	0	6	3
Totals		10		16			11					0	26	13	4	22	11

9	XP		Incandescent explosion proof fixtures
1	XQ		Incandescent Lamp
		15 H8	4' 2L Wraparound Damp location
		1 CQ	PS20 compact Fluorescent Screw-in

BLDG 63-100

Room		Remv Fixt.	Fixt. Type	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	Remv Hldrs.	T8 Lamps	Elect. Blsts.
Office 1							2	4	C4	2	C8		8	4	4	4	2
Office 1							4	2	L1	2	L8		8	4	0	8	4
Womens Toilet							2	2	L1	2	L8		4	2	0	4	2
Office 2							2	4	B	2	BR	2	8	4	4	4	2
M-S Distribution							29	4	F	2	F8		116	58	58	58	29
Hall 1		3	L1				1	2	L1	2	L8		2	1	0	2	1
Mens Toilet		1	L1				1	2	L1	2	L8		2	1	0	2	1
Change Room							4	2	L1	2	L8		8	4	0	8	4
Hall 2		5	L1				3	2	L1	2	L8		6	3	0	6	3
Clean Room		3	C2				27	2	C5	2	C8		54	27	0	54	27
Clean Room		2	C5										0	0	0	0	0
Storage/Break		2	C5				12	2	C5	2	C8		24	12	0	24	12
Totals		16		0			87					2	240	120	66	174	87

9	L1	4' 2L Industrial
3	C2	8' 4L Industrial
4	C5	8' 2L Industrial

BLDG 63-110

Room		Remv Fixt.	Fixt. Type	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	Remv Hldrs.	T8 Lamps	Elect. Blsts.
Layout 1							3	2	A1	2	A8		6	3	0	6	3
Layout 1							45	4	F	2	F8		180	90	90	90	45
Layout 2							9	4	C6	2	C8		36	18	18	18	9
Bonding							6	4	F	3	F3		24	12	12	18	6
Storage A		1	B1				1	4	B1	2	A8		4	2	2	2	1
Smoke Break		1	F				2	4	F	2	F8		8	4	4	4	2
Break Room		1	F				2	4	F	2	F8		8	4	4	4	2
Restrooms							1	2	A1	2	A8		2	1	0	2	1
Storage B		1	A1				1	2	A1	2	A8		2	1	0	2	1
Office							2	4	F	2	F8		8	4	4	4	2
Hallway							3	4	F	2	F8		12	6	6	6	3
Totals		4		0			75					0	290	145	140	156	75

1	B1	4' 4L wraparound
2	F	2X4 4L Troffer
1	A1	4' 2L Wraparound

BLDG 63-120

Room		Remv Fixt.	Fixt. Type	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	Remv Hldrs.	T8 Lamps	Elect. Blsts.
Loading Area 1							10	2	H	2	H8		20	10	0	20	10
Change Area		2	X5	2	CF		2	2	A	2	A8		4	2	0	4	2
Change Area							2	4	B	2	A8		8	4	4	4	2
R/A Storage		1	F				1	4	F	2	F8		4	2	2	2	1
Office							2	4	F	2	F8		8	4	4	4	2
Restroom							1	2	A	2	A8		2	1	0	2	1
Tool Room Ofc							1	2	L1	2	L8		2	1	0	2	1
Break Room							2	4	F	2	F8		8	4	4	4	2
Totals		3		2			21					0	56	28	14	42	21

2 X5 Incandescent Shower Light - Remove Lamps
1 F 2X4' 4L Troffer
2 CF PS 23 Compact Fluorescent lamp / SHOWER LIGHT

BLDG 63-200

Room		Remv Fixt.	Fixt. Type	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	Remv Hldrs.	T8 Lamps	Elect. Blsts.
Main Assembly							68	4	F	4	F8		272	136	0	272	68
Main Assembly							14	4	F	2	FR	14	56	28	28	28	14
Break Room							13	4	F	2	F2		52	26	26	26	13
Storage							3	2	G	2	F2		6	3	0	6	3
Office 1							2	2	G	2	F2		4	2	0	4	2
Office 2							4	2	G	2	F2		8	4	0	8	4
Totals		0		0			104					14	398	199	54	344	104

BLDG 63-210

Room		Remv Fixt.	Fixt. Type	Install Fixt.	Fixt. Type		Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	Remv Hldrs.	T8 Lamps	Elect. Blsts.
Main Work Area		15	C3				50	2	C3	2	C8		100	50	0	100	50
M43 Test							15	2	G	2	G8		30	15	0	30	15
Storage Rooms							3	2	C3	2	C8		6	3	0	6	3
Break Room							10	2	G	2	G8		20	10	0	20	10
Office/Tool Rm							7	2	G	2	G8		14	7	0	14	7
Totals		15		0			85					0	170	85	0	170	85

15 C3 8' 2L Industrial

BLDG 63-410

Room	Remv. Fixt.	Fixt. Type	Install Fixt.	Fixt. Type	Upgrade Fixt.	Lmp.	Type	Lmp.	New Type	Install Refl.	Rmv. Lamps	Rmv. Blsts.	Rmv. Hldrs.	T8 Lamps	Elect. Blsts.
Entrance	2	R1	2	I8							0	0	0	0	0
Alcove	1	R1	1	I8							0	0	0	0	0
Locker Room 1	10	R	10	I8	3	1	R2	1	W8		3	3	0	3	3
Showers 1					10	1	J1	1	J8		10	10	0	10	10
Locker Room 2	7	R	7	I8	1	1	R2	1	W8		1	1	0	1	1
Showers 2					6	1	J1	1	J8		6	6	0	6	6
Locker Room 3	3	R	3	I8							0	0	0	0	0
Restroom 1	1	R	1	I8	1	1	J1	1	J8		1	1	0	1	1
Open Area/RR 2					1	1	R2	1	W8		1	1	0	1	1
Open Area/RR 2					4	1	R	1	R8		4	4	0	4	4
Alcove 7	1	R	1	I8							0	0	0	0	0
Hallway 1					2	1	R	1	R8		2	2	0	2	2
Office 1/Kitchen	6	R	6	W2	1	1	T6	1	W8		1	1	0	1	1
Break Room	12	R	8	W2							0	0	0	0	0
Offices 3&4	6	R1	6	W2							0	0	0	0	0
Mens Toilet	2	R	2	I8	1	1	T6	1	W8		1	1	0	1	1
Hall/Jan/RR Ent					3	1	R	1	R8		3	3	0	3	3
Womens Toilet	2	R1	2	I8							0	0	0	0	0
Entrance 2					1	1	R1	1	R8		1	1	0	1	1
Mens Change	10	R	10	I8	3	1	T6	1	W8		3	3	0	3	3
Mens Shower					9	1	J1	1	J8		9	9	0	9	9
Open Area 2	2	R	2	I8							0	0	0	0	0
Restroom 5	2	R	2	I8	1	1	R1	1	W8		1	1	0	1	1
Womens Lockers	6	R	6	I8	1	1	R2	1	W8		1	1	0	1	1
Womens Shower					6	1	J1	1	J8		6	6	0	6	6
Womens Toilet	3	R	3	I8	1	1	R2	1	W8		1	1	0	1	1
Toilet Alcove	1	R	1	I8							0	0	0	0	0
Ice Machine	2	R	2	I8							0	0	0	0	0
Clothing Issue	6	R1	6	I8							0	0	0	0	0
Mask Storage	12	R	12	I8							0	0	0	0	0
Totals	97		93		55					0	55	55	0	55	55

80	R		4' 1L Corridor Wrap
17	R1		4' 1L Corridor Wrap
	73	I8	4' 1L Surface Strip
	20	W2	4' 2L Ceiling Wraparound

APPENDIX B
PROJECT DESCRIPTIONS
AND CALCULATIONS

ECO Number 1

UPGRADE OR REPLACE LIGHTING

Discussion

Several investigations for energy conservation opportunities were combined into one ECO. Data were taken in each room of each of the 45 surveyed buildings to determine the type and condition of the existing luminaires, representative illumination levels (footcandles) representative types of lamps and ballasts, the room dimensions, the height and location of the fixtures, and the type and accessibility of switching. Notations were done on RS&H-provided data forms, and photographs were taken were allowed by security. Drawings were provided by the Arsenal's Engineering Plans and Services and were also used to note fixture positions. Fixture positions in each room were input to the analysis programs, and are contained in Volume II, appendix B of the Pine Bluff Arsenal Lighting Survey Report (June 1995).

A PC-based computer program, "Lite-Pro," provided by USI Lighting Company, was used to analyze the illumination levels point-by-point and the unit power density within each room. The program also keeps track of the number of fixtures, by type, for each building and each room.

Initially, analyses were done for the existing luminaires. Although the photometric data base of Lite-pro is extensive, it was not possible to match existing fixtures exactly to the data base because of lack of manufacturers names and model numbers. Fixture types were noted during the site survey, however, and similar fixtures were selected for analysis. Calculated illuminance levels were reasonably close to those noted on the site survey data sheets, given the wide range of conditions and lifetimes of the existing fixtures.

Point-by-point analysis was then done for each room with the following criteria:

1) Illuminance levels were to be brought into line with AEI recommendations shown in Table 3-1. In many cases, present levels are too high.

2) T8 lamps and electronic ballasts would replace existing T12 lamps and electromagnetic ballasts, including energy-saving lamps and ballasts already in place. The T12 and electromagnetic-technologies should be phased out and the T8 technology adopted installationwide.

3) Existing fixtures would be used where possible. If illuminance levels were reduced lamps would be removed; reflectors would be installed if necessary to meet AEI footcandle (FC) recommendations. Fixtures would be moved if practical and necessary.

4) Higher-efficiency fixtures would replace low-efficiency fixtures were practical.

5) Compact fluorescent lamps would replace incandescent lamps where practical. Exceptions were made for fixtures with low utilization (e.g. janitors' closets).

6) Excessive fixtures would be removed where necessary.

Appendix A contains a summary and details of the changes made by building based on analysis result. In all:

1) 843 fixtures are removed, and 641 installed. The installed fixtures are various energy-efficient types, and include compact fluorescent replacement of incandescent lamps. All new fixtures employ T8 technology.

2) 3,109 fixtures are changed (upgraded); 8,776 lamps and 4,475 ballasts are removed, and 6,464 T8 lamps and 3,109 electronic ballasts installed; 270 reflectors are also installed in existing fixtures.

Table 4-4 is a summarization of the energy analysis results, by building. The table shows comparisons between the existing lighting systems and the proposed replacements:

1) Average unit power density for the 45 buildings will be reduced from 1.3 W/SF to 0.7 W/SF.

2) Total luminaire wattage will be reduced from 565 kW to kW (52 percent).

3) Annual energy use, assuming 2,500 hours per year average use per fixture, will be reduced from approximately 1,411,620 kWh/hr to 676,925 kWh/yr.

Table 4-4. Energy Analysis Summary

	Bldg. No.	Function	Present System W/SF	Present System kW	Present System kWh/yr	Present System # Fixt.	Replacement System W/SF	Replacement System kW	Replacement System kWh/yr	Replacement System # Fixt.	Savings kW	Savings kWh/yr
1	10020	Administration	3.0	38.5	98,215	214	1.0	11.9	29,858	193	26.6	68,358
2	10030	Admin General Purpose	1.4	8.6	21,465	71	0.6	4.8	11,918	69	3.8	9,548
3	10050	Fire HQ	0.9	10.2	25,483	105	0.7	7.3	18,365	103	2.8	7,118
4	13010	Community Services	2.8	5.2	13,110	32	1.0	2.0	5,010	32	3.2	8,100
5	13020	Health Clinic	1.7	6.6	16,385	57	1.0	3.2	7,890	56	3.4	8,495
6	13030	52nd EOD	1.3	3.5	8,798	28	0.8	2.2	5,405	28	1.4	3,393
7	13040	Counseling Facility	1.6	2.5	6,348	31	1.0	1.6	3,955	27	1.0	2,393
8	13060	Clinic	2.6	3.5	8,840	23	0.9	1.2	3,103	20	2.3	5,738
9	13080	Laboratory	3.1	3.5	8,678	24	1.3	1.4	3,458	24	2.1	5,220
10	13100	Infirmary	1.3	2.5	6,240	24	1.0	1.8	4,415	24	0.7	1,825
11	13110	Audio-Visual Facility	2.3	4.5	11,188	36	1.2	2.3	5,785	32	2.2	5,403
12	16210	Barracks (halls, showers, latrines)	1.3	1.8	4,490	23	0.8	0.9	2,303	18	0.9	2,188
13	16220	Barracks (halls, showers, latrines)	1.3	1.8	4,490	23	0.8	0.9	2,303	18	0.9	2,188
14	31010	Electronic Calibration	3.0	1.0	2,385	6	2.1	0.7	1,650	6	0.3	735
15	31080	Electronic Calibration	1.9	3.2	8,100	24	1.1	1.9	4,870	24	1.3	3,230
16	32030	Inspection Garage	0.6	3.3	8,133	19	0.5	2.5	6,365	28	0.7	1,768
17	32035	Ordinance Shop	1.2	20.7	51,660	252	0.9	14.9	37,170	252	5.8	14,490
18	32060	Boiler & Compressor House	0.3	1.5	3,840	10	0.2	1.0	2,507	10	0.5	1,133
19	32070	Impreg. & Laundry	1.3	14.6	36,573	104	1.0	10.8	27,075	103	3.8	9,498
20	32090	Warehouse	1.6	9.8	24,580	60	0.7	3.6	8,968	60	6.2	15,613
21	32100	Elect/Comm. Calibration	2.4	25.0	62,470	138	1.0	10.1	25,300	135	14.9	37,170
22	32130	Ammo Quality Assurance	2.8	8.4	21,095	52	1.0	3.2	7,893	51	5.3	13,203
23	32150	Ammo Quality Assurance	1.6	2.0	4,980	24	1.1	1.4	3,540	24	0.6	1,440
24	33060	Boiler & Compressor House	0.3	1.5	3,840	10	0.2	1.0	2,507	10	0.5	1,133
25	33530	Fill and Press (packout areas only)	2.4	17.1	42,713	83	0.6	4.3	10,768	73	12.8	31,945
26	34110	WP Filling	0.6	50.9	127,335	589	0.4	34.7	86,850	589	16.2	40,485
27	34120	Ammo Quality (south end only)	2.1	11.5	28,890	76	0.8	4.1	10,205	61	7.4	18,485
28	34140	Boiler & Compressor House	1.8	3.8	9,433	28	1.0	2.1	5,213	25	1.7	4,220
29	34910	Admin/FE Maint. Shop	2.1	114.5	286,220	507	0.9	41.9	104,640	500	72.6	181,580
30	34970	Administration	3.0	5.7	14,380	42	1.0	2.0	4,890	34	3.8	9,470
31	44100	Production Field Office	1.4	34.8	86,813	300	0.8	15.0	37,820	259	19.8	48,993
32	51420	Offices/DMMD	2.8	20.8	52,060	134	1.0	7.0	17,405	118	13.9	34,655
33	51430	Engineering Administration	2.7	4.5	11,330	33	1.2	1.9	4,838	29	2.6	6,493
34	53180	Chemical Administration	2.0	7.7	19,268	60	0.9	3.4	8,385	60	4.4	10,883
35	60020	Security	0.9	7.8	19,515	58	0.4	3.6	9,030	58	4.2	10,485
36	60060	Administration	2.2	7.6	19,123	51	0.9	3.0	7,428	51	4.7	11,695
37	60070	Fixed Laundry	1.7	8.3	20,865	78	1.0	4.8	12,033	77	3.5	8,833
38	60090	TC Administration	3.3	6.0	15,120	34	1.0	1.9	4,668	33	4.2	10,453
39	60830	Warehouse	0.7	6.2	15,458	39	0.8	5.1	12,668	45	1.1	2,790
40	63100	Chemical Field Maint. Shop	1.6	14.1	35,203	103	0.8	7.0	17,595	87	7.0	17,608
41	63110	Chemical Maint. shop	1.4	14.1	35,148	80	0.5	5.1	12,650	78	9.0	22,498
42	63120	Chemical Field Maint. Shop	0.9	10.2	25,535	58	0.8	8.5	21,165	55	1.7	4,370
43	63200	Chemical Field Maint. Shop	1.4	18.5	41,315	104	0.8	9.4	23,400	104	7.2	17,915
44	63210	Mask Repair	1.0	11.3	28,220	103	0.7	7.8	19,383	88	3.5	8,838
45	63410	Toxic/Conventional Change House	1.0	7.8	19,115	168	0.8	5.9	14,685	183	1.8	4,430
		TOTALS	1.2	564.8	1,411,618	4,110	0.8	270.8	678,925	3,928	293.9	734,693

RS&H®

SUBJECT PBA LIGHTING SURVEY
DESIGNER C. WARREN
CHECKER

AEP NO 684-1331-001
SHEET OF
DATE 3/24/95
DATE

ESTIMATED SAVINGS – A/C

$$\text{Cooling kWh/yr} = \left(\text{lighting } \frac{\text{kWh}}{\text{yr}}\right) \times (\%\ \text{months cooling}) \times \left(\frac{3.413}{\text{SEER (Btuh/W)}}\right) \times (\%\ \text{light into cooled space})$$

(1) (2) (3) (4)

ASSUMPTIONS

(1) Savings in kWh/yr = (42,713 − 10,768) = 31,945

(2) % cooling months = 50% (6/12)

(3) SEER = 8

(4) % into cooled space = 25%

$$\text{Savings kWh/yr} = (34,693)(.5)\left(\frac{3.413}{8}\right)(.25) = 39,180$$

$$\$\ \text{SAVINGS} = (39,180)\ \frac{\text{kwh}}{\text{yr}} \times 0.0662/\text{kWh} = \$2594/\text{yr}$$

SAY $\underline{\$2600/\text{yr}}$

CONSTRUCTION COST ESTIMATE

Project:	Lighting Upgrade	RS&H No.:	694-1331-001
Location:	Pine Bluff Arsenal, AR	Date:	23-Mar-95
Basis:	Pre-Design Study	Estimator:	W.T.Todd
Building:	Summary	Filename:	EST-SUMP.WQ1

ITEM DESCRIPTION	QUANTITY No.	Unit	LABOR $/Unit	Total	MATERIAL $/Unit	Total	TOTAL COST	SOURCE Labor	Material
Total Bare Costs				154873		139066	$293,939		
Economy of Scale			-20.0%	-30975		0	(30,975)	MEp360	
Subtotal				123898		139066	262,964		
City Cost Index			-30.1%	-37293	-3.5%	-4867	(42,160)	MEp388	MEp388
Subtotal				86605		134199	220,804		
OH & Profit Markups			50.0%	43303	10.0%	13420	56,723	MEp1BC	MEp3
Subtotal				129908		147619	277,527		
Sales Taxes				0	6.5%	9610	9,610		PBA
Subtotal				129908		157229	287,137		
Contingency			10.0%	12991	10.0%	15723	28,714	MEp4	MEp4
Subtotal				142899		172952	315,851		
Design Fee	6.0%			18951		0	18,951	PBA	
SIOH	6.0%			18951		0	18,951	PBA	
Total Const. Cost				180801		172952	$353,753		

LEGEND & NOTES

Labor costs based on Means manhour estimates and labor rate ($27.50/hr).

DGSC	Defense General Supply Center, February 1994 Catalog.
GRp###	Grainger Catalog No. 385, page ###, x 0.80 for contr price.
MBp###	Means Building Construction Cost Data, 1994, page ###.
MEp###	Means Electrical Cost Data, 1994, page ###.
NLp###	National Lighting Maintenance Supply Corp., 1995, page ###.
OS/SYL	Telephone quote from Osram/Sylvania representative.
PBA	Information provided by Pine Bluff Arsenal staff.
(1)	Assume lampholder removal takes 5 minutes each.
(2)	Assume 15 minutes for installation of reflector.
(3)	Assume 20 minutes for installation of reflector.
(4)	Assume 25 minutes for installation of reflector.

CONSTRUCTION COST ESTIMATE

Project: Lighting Upgrade
Location: Pine Bluff Arsenal, AR
Basis: Pre-Design Study
Building: Summary

RS&H No.: 694-1331-001
Date: 23-Mar-95
Estimator: W.T.Todd
Filename: EST-SUMP.WQ1

ITEM DESCRIPTION	QUANTITY		LABOR		MATERIAL		TOTAL COST	SOURCE	
	No.	Unit	$/Unit	Total	$/Unit	Total		Labor	Material
Fixture Removal									
2x2 UTF or Inc Surf	30	Ea	10.01	300	0.00	0	300	MEp17	N/A
2x4 FI Troffer	83	Ea	14.66	1217	0.00	0	1,217	MEp17	N/A
4' FI Surf Strip	74	Ea	9.79	724	0.00	0	724	MEp18	N/A
4' FI Surf Wrap	191	Ea	13.34	2548	0.00	0	2,548	MEp17	N/A
4' FI Pend Indust	52	Ea	12.57	654	0.00	0	654	MEp18	N/A
8' FI Pend Indust	32	Ea	16.31	522	0.00	0	522	MEp18	N/A
8' FI Surf Strip	155	Ea	11.00	1705	0.00	0	1,705	MEp18	N/A
Low Bay Fixture	151	Ea	22.00	3322	0.00	0	3,322	MEp18	N/A
High Bay Fixture	8	Ea	29.34	235	0.00	0	235	MEp18	N/A
Repair Plas Ceiling	450	SF	0.63	284	0.37	167	451	MBp229	MBp229
Inst. Ceiling Tile	664	SF	0.36	239	0.72	478	717	MBp237	MBp237
Fixture Installation									
11" Srf, 2-26W CFL	9	Ea	27.50	248	79.95	720	968	MEp209	NLp12
High Bay, 1-100W MH	8	Ea	95.65	765	186.27	1490	2,255	MEp208	GRp923
4', 1 Lamp Indust.	2	Ea	36.99	74	52.34	105	179	MEp208	GRp918
4', 2 Lamp Indust.	175	Ea	38.61	6757	53.24	9317	16,074	MEp208	GRp917
4', 2 Lmp Ind w/Refl	18	Ea	38.61	695	58.24	1048	1,743	MEp208	GRp918
4', 1 Lamp Strip	74	Ea	25.88	1915	44.18	3269	5,184	MEp208	GRp915
4', 2 Lamp Strip	2	Ea	27.50	55	47.99	96	151	MEp208	NLp15
2x4, 2 Lamp Surf Mt	1	Ea	35.48	35	76.04	76	111	MEp208	MEp208
2x4, 2 Lamp Troffer	4	Ea	41.50	166	58.99	236	402	MEp207	NLp15
4', 2 Lamp WA	77	Ea	31.43	2420	56.54	4354	6,774	MEp208	NLp15
4', 2 Lamp WA Wet	23	Ea	68.75	1581	84.04	1933	3,514	MEp210	MEp210
4', 2 Lamp WA w/Refl	167	Ea	31.43	5249	75.54	12615	17,864	MEp208	NLp15
4', 4 Lamp WA	2	Ea	41.50	83	71.58	143	226	MEp208	NLp15
8', 2 Lamp Indust.	32	Ea	50.00	1600	84.44	2702	4,302	MEp208	GRp917
Fixture Upgrades									
Remove Incand Lamps	50	Ea	1.38	69	0.00	0	69	MEp215	N/A
Install Integral CF									
15W w/ Elec Bal	6	Ea	1.38	8	19.95	120	128	MEp215	NLp9
20W w/ Elec Bal	28	Ea	1.38	39	19.95	559	598	MEp215	NLp9
23W w/ Elec Bal	10	Ea	1.38	14	19.95	200	214	MEp215	NLp9
28W w/ Mag Bal	6	Ea	1.38	8	29.95	180	188	MEp215	NLp10
Remove Fluor Lamps	8776	Ea	1.83	16060	0.00	0	16,060	MEp13	N/A
Remove Ballasts	4475	Ea	11.00	49225	0.00	0	49,225	MEp211	N/A
Remove Lampholders	3369	Ea	2.29	7715	0.00	0	7,715	(1)	N/A
Install T8 Lamps									
F32T8/TL70/35K	5398	Ea	1.83	9878	2.02	10904	20,782	MEp13	DGSC
F96T8/TL70/35K	1040	Ea	1.83	1903	6.40	6656	8,559	MEp13	OS/SYL
FB32T8/TL70/35K	26	Ea	1.83	48	9.34	243	291	MEp13	DGSC
Install T8 Ballasts									
2-F32T8 Lamps	2404	Ea	11.00	26444	22.50	54090	80,534	MEp211	OS/SYL
3-F32T8 Lamps	49	Ea	11.00	539	23.50	1152	1,691	MEp211	OS/SYL
4-F32T8 Lamps	137	Ea	11.00	1507	24.50	3357	4,864	MEp211	OS/SYL
2-F96T8 Lamps	520	Ea	11.00	5720	35.00	18200	23,920	MEp211	OS/SYL
Install Reflectors									
4' Strp or Indst	14	Ea	6.88	96	7.95	111	207	(2)	NLp18
4' Wrap or Surf	77	Ea	9.17	706	15.90	1224	1,930	(3)	NLp18
2x4 Troffer	131	Ea	11.46	1501	25.35	3321	4,822	(4)	NLp18
Total Bare Costs				154873		139066	$293,939		

RS&H

Construction Cost Estimate

SHEET OF

AE FILE NO. 694-1331-001

PROJECT: Lighting Upgrade

DATE: 3-23-95

Location: Pine Bluff Arsenal, AR

ESTIMATOR: WTT

CHECKER

BASIS FOR ESTIMATE
☒ PRE-DESIGN STUDY ☐ SCHEMATIC DESIGN ☐ DESIGN DEVELOPMENT ☐ FINAL DESIGN

SUMMARY Maint./Lamp Replace.	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR (2) PER UNIT	LABOR (2) TOTAL	MATERIAL (1) PER UNIT	MATERIAL (1) TOTAL	TOTAL COST
Assume average life of T12 and T8 systems is 15000 hours							
15000 hrs ÷ 2500 Op. hrs/year ⇒ 6.0 year life							
T12 LAMP REPLACEMENT:							
F40 T12 Lamps	9221	Ea			1.69	×0.80	12467
F96 T12 Lamps	1690	Ea			4.27	×0.80	5773
FB40 T12 Lamps	26	Ea			7.41	×0.80	154
Subtotal							18394
Markup for Profit						10%	1839
Total Cost							$20,233
Cost per Year				$20233		÷6.0 =	$3,372
T8 LAMP REPLACEMENT:							
F32 T8 Lamps	6488	Ea			2.02		13106
F96 T8 Lamps	1104	Ea			6.40		7066
FB32 T8 Lamps	26	Ea			9.34		243
Subtotal							20415
Markup for Profit						10%	2042
Total Cost							22457
Cost per Year				$22457		÷6.0 =	$3,743

(1) Material cost for T12 lamps from Grainger ×0.8 for contractor price.
(2) Assume labor cost is the same for T8 or T12 replacement.

RS&H

SUBJECT Lighting Upgrade Pine Bluff Arsenal, AR
DESIGNER WTT
CHECKER

AEP NO 694-1331-001
SHEET ____ OF ____
DATE 3-24-95
DATE ____

Maintenance / Replacement Cost

Existing T12 Lamps :

	F40 T12	F96 T12
Lamps Removed	8776	8776
Assume 85% ave 4'	x 0.85	x 0.15
Subtotal	7460	1316
Fixtures Removed	587	187
x Lamps per fixture	x 3	x 2
Subtotal	1761	374
Total Exist. Lamps	9221	1690

New T8 Lamps :

	F32 T8	F96 T8
Lamps Installed	5398	1040
Fixtures Added	545	32
x Lamps per fixture	x 2	x 2
	1090	64
Total T8 Lamps	6488	1104

ECO Number 4

OCCUPANCY SENSORS

Discussion

The site survey revealed that lights were on in many unoccupied areas. Candidates for occupancy sensors are restrooms, breakrooms, conference rooms and offices. Screening calculations showed that occupancy sensors in restrooms and breakrooms offer potential simple paybacks within the ten-year limitation.

RS&H

SUBJECT Occupancy Sensors
DESIGNER Antkiw
CHECKER

AEP NO 9511
SHEET ___ OF ___
DATE 3/20/95
DATE ___

Summary

Occupancy Sensors

Based on screening calculations - to maintain paybacks less than 10 yrs. the following is a list of required wattage to be controlled by space type

Type	min. wattage	OPN HRS	% SAVINGS	kW	kwh SAVED	$ SAVED
Restrooms	60	8760	90	18.8	148,200	$7100
Breakrooms	180	1820	86	14.1	22,100	$1100
Offices	300	1820	18	—	—	—
TOTALS					170,300	$8200

	Before	After
Energy use (kwh)	190,350	20050
Energy cost	$9100	$900

Simple Payback = $\frac{122 * 91}{8200} = 1.35$ yrs

Electricity rate: 6.6¢/kwh avg (incl. demand)
3.0¢/kWh - energy only
use 4.8¢/kwh since demand will not always be reduced

Grout prices

Ceiling Mtd. Sensor	56.11	Labor est. 1 hr @ 40 * 0.67 (1) * 1.5 (2) = 40/hr.
Power Pack	17.54	
Brackets	7.00	(1) Means labor index for Pine Bluff
	90.65	(2) Mark ups

PINEBLUFF ARSENAL
LIGHTING STUDY
OCCUPANCY SENSORS
FILENAME: OCCINV.WQ1

SAVINGS CALC.'S

BLDG #	ROOM TYPE BR	RR	# FIXT	W/ FIXT	TOT WATTS	# CIRC	WATTS/ CIRC.	MEETS CRIT.	WATTS CTRLD BR	RR
10020	1		4	113	452	1	452	1	452	0
	1		2	60	120	1	120	0	120	0
	1		10	60	600	3	200	1	200	0
10030	1		2	59	118	1	118	0	118	0
		1	3	34	102	1	102	1	0	102
		1	1	60	60	1	60	1	0	60
		1	1	60	60	1	60	1	0	60
10050	1		4	425	1700	1	1700	1	1700	0
	1		5	61	305	1	305	1	305	0
	1		4	59	236	1	236	1	236	0
	1		6	59	354	1	354	1	354	0
	1		2	59	118	1	118	0	118	0
		1	2	83	166	2	83	1	0	166
	1		4	59	236	1	236	1	236	0
		1	1	59	59	1	59	1	0	59
13010		1	1	40	40	1	115	1	0	40
			1	75	75			0	0	0
	1		4	59	236	1	236	1	236	0
13020		1	1	75	75	1	75	1	0	75
		1	2	75	150	1	150	1	0	150
		1	1	75	75	1	75	1	0	75
13030		1	1	59	59	1	59	1	0	59
	1		1	59	59	1	59	0	59	0
	1		1	59	59	1	59	0	59	0
	1		3	110	330	1	330	1	330	0
	1		2	110	220	1	220	1	220	0
		1	1	75	75	1	75	1	0	75
13040	1		2	59	118	1	118	0	118	0
		1	1	59	59	1	59	1	0	59
		1	1	59	59	1	59	1	0	59
13060		1	1	60	60	1	60	1	0	60
13080		1	3	48	144	1	144	1	0	144
		1	3	48	144	1	144	1	0	144
13100		1	1	100	100	1	100	1	0	100
13110		1	1	60	60	1	60	1	0	60
TOTALS	16	18	83		6,883	37		28	4,861	1,547

BLDG #	ROOM TYPE BR	RR	# FIXT	W/ FIXT	TOT WATTS	# CIRC	WATTS/ CIRC.	MEET CRIT.	WATTS CTRLD BR	RR
16210	1		2	59	118	1	118	0	118	0
		1	1	83	83	1	83	1	0	83
	1		2	34	68	1	124	0	124	0
			1	56	56			0	0	0
		1	1	34	34	1	93	1	0	34
			1	59	59			0	0	0
16220	1		2	59	118	1	118	0	118	0
		1	1	83	83	1	83	1	0	83
	1		2	34	68	1	124	0	124	0
			1	56	56	1		0	0	0
		1	1	34	34	1	93	1	0	34
			1	59	59	1		0	0	0
31010			-	-	-	-	-	0	0	0
31080		1	2	59	118	1	118	1	0	118
	1		2	61	122	1	122	0	122	0
32030			-	-	-	-	-	0	0	0
32035	1		6	59	354	2	177	1	177	0
		1	2	59	118	1	118	1	0	118
32060		1	6	105	630	2	315	1	0	630
		1	3	91	273	1	373	1	0	273
			1	100	100	1		0	0	0
32070	1	1	2	105	210	1	210	1	210	210
		1	1	105	105	1	105	1	0	105
		1	1	105	105	1	105	1	0	105
32090		1	1	59	59	1	59	1	0	59
		1	1	59	59	1	59	1	0	59
	1		8	59	472	2	236	1	236	0
		1	2	59	118	1	118	1	0	118
32100	1		3	59	177	1	177	1	177	0
		1	3	59	177	1	177	1	0	177
		1	3	59	177	1	177	1	0	177
32130		1	2	85	170	1	170	1	0	170
32150		1	1	59	59	1	59	1	0	59
		1	1	59	59	1	59	1	0	59
		1	1	59	59	1	59	1	0	59
		1	1	59	59	1	59	1		
33060		1	6	105	630	2	315	1		
		1	3	91	273	1	373	1		
			1	100	100	1		0		
33530			-	-	-	-	-	0		
TOTALS	9	23	79		5,619	39		26	1,406	2,730

Notes: BR = breakroom or similar type
RR = restroom or similar type
Criteria = for BR controlled watts must be greater than 175 W
= for RR controlled watts must be greater than 58 W

BLDG #	ROOM TYPE BR	RR	# FIXT	W/ FIXT	TOT KW	# CIRC	WATTS/ CIRC.	MEETS CRIT.	WATTS CTRLD BR	RR
34110			-	-	-	-	-	0	0	0
34120	1		2	59	118	1	118	0	118	0
		1	1	34	34	1	152	1	0	34
			2	59	118			0	0	0
34140		1	1	105	105	1	105	1	0	105
		1	8	59	472	2	406	1	0	472
			4	85	340	1		0	0	0
		1	2	59	118	1	118	1	0	118
		1	4	105	420	1	420	1	0	420
		1	4	105	420	1	420	1	0	420
34910	1		15	59	885	1	885	1	885	0
	1		7	59	413	1	413	1	413	0
	1		4	59	236	2	118	0	118	0
	1		2	59	118	1	118	0	118	0
	1		12	59	708	2	354	1	354	0
	1		2	59	118	1	118	0	118	0
	1		2	59	118	1	118	0	118	0
	1		4	59	236	1	236	1	236	0
	1		1	59	59	1	59	0	59	0
	1		6	59	354	1	354	1	354	0
	1		2	59	118	1	118	0	118	0
34970		1	1	59	59	1	59	1	0	59
		1	1	34	34	1	34	0	0	34
	1		1	59	59	1	59	0	59	0
44100	1		2	59	118	1	118	0	118	0
		1	13	59	767	1	767	1	0	767
		1	6	59	354	2	177	1	0	354
		1	36	59	2124	4	531	1	0	2124
		1	8	59	472	2	236	1	0	472
		1	6	59	354	1	354	1	0	354
		1	5	59	295	1	295	1	0	295
		1	2	34	68	1	245	1	0	68
			3	59	177			0	0	0
		1	4	59	236	1	236	1	0	236
		1	3	59	177	1	177	1	0	177
51420	1		3	59	177	1	177	1	177	0
		1	4	59	236	1	236	1	0	236
		1	3	59	177	1	177	1	0	177
		1	2	59	118	1	118	1	0	118
		1	3	59	177	1	177	1	0	177
	1		2	59	118	1	118	0	118	0
51430		1	1	75	75	1	75	1	0	75
		1	2	23	46	1	46	0	0	46
TOTALS	16	23	196		11,926	48		27	3,481	7,338

BLDG #	ROOM TYPE BR	RR	# FIXT	W/ FIXT	TOT KW	# CIRC	WATTS/ CIRC.	MEET CRIT.	WATTS CTRLD BR	RR
53160	1		9	59	531	1	531	1	531	0
		1	2	34	68	1	68	1	0	68
			9	59	531	2	266	0	0	0
		1	1	34	34	1	34	0	0	34
			12	59	708	3	236	0	0	0
		1	2	59	118	1	118	1	0	118
60020	1		2	59	118	1	118	0	118	0
		1	1	59	59	1	59	1	0	59
		1	1	59	59	1	59	1	0	59
		1	2	59	118	1	118	1	0	118
		1	5	59	295	1	295	1	0	295
60060	1		6	59	354	1	354	1	354	0
		1	1	34	34	1	93	1	0	34
			1	59	59			0	0	0
		1	2	59	118	1	118	1	0	118
60070		1	2	59	118	1	118	1	0	118
		1	2	59	118	1	118	1	0	118
		1	2	59	118	1	118	1	0	118
		1	1	59	59	1	59	1	0	59
60090	1		1	59	59	1	59	0	59	0
		1	3	34	102	1	102	1	0	102
		1	2	34	68	1	68	1	0	68
60630	1		2	59	118	1	118	0	118	0
		1	2	59	118	1	118	1	0	118
		1	1	23	23	1	23	0	0	23
			3	59	177	1	177	0	0	0
63100		1	2	59	118	1	118	1	0	118
		1	1	59	59	1	59	1	0	59
		1	4	59	236	1	236	1	0	236
	1		2	59	118	1	118	0	118	0
63110	1		2	59	118	1	118	0	118	0
	1		2	59	118	1	118	0	118	0
63120	1		2	12	24	1	260	1	260	0
			4	59	236			0	0	0
		1	1	59	59	1	59	1	0	59
	1		2	59	118	1	118	0	118	0
63200	1	1	9	59	531	1	531	1	531	531
		1	2	59	118	1	118	1	0	118
			2	59	118	1	118	0	0	0
63210	1		10	59	590	1	690	1	690	0
			1	100	100			0	0	0
								0	0	0
								0	0	0
TOTALS	12	23	123		6,943	41		25	3,133	2,748

Notes: BR = breakroom or similar type
RR = restroom or similar type
Criteria = for BR controlled watts must be greater than 175 W
= for RR controlled watts must be greater than 58 W

BLDG #	ROOM TYPE BR	RR	# FIXT	W/ FIXT	TOT KW	# CIRC	WATTS/ CIRC.	MEETS CRIT.	WATTS CTRLD BR	RR
63410		1	13	59	767	2	384	1	0	767
		1	10	59	590	2	295	1	0	590
		1	8	59	472	2	236	1	0	472
		1	2	59	118	1	118	1	0	118
		1	1	22	22	1	199	1	0	22
			3	59	177			0	0	0
		1	6	59	354	1	354	1	0	354
		1	3	59	177	1	177	1	0	177
	1		7	59	413	1	413	1	413	0
	1		8	59	472	1	472	1	472	0
		1	1	59	59	1	236	1	0	59
			3	59	177			0	0	0
		1	3	59	177	1	177	1	0	177
		1	13	59	767	1	767	1	0	767
		1	1	22	22	1	553	1	0	22
			9	59	531			0	0	0
		1	3	59	177	1	177	1	0	177
		1	7	59	413	1	413	1	0	413
		1	6	59	354	1]		0	0	354
	1		4	59	236	1	236	1	236	0
	1		1	22	22	1	140	0	140	0
			2	59	118				0	0
TOTALS	4	14	114		6,615	21		16	1,261	4,469
GRAND TOTALS	57	101	595		37,986	186		122	14,142	18,832

Notes: BR = breakroom or similar type
RR = restroom or similar type
Criteria = for BR controlled watts must be greater than 175 W
= for RR controlled watts must be greater than 58 W

PINEBLUFF ARSENAL
SCREENING CALCULATIONS
OCCUPANCY SENSORS
FILENAME: OSENS.WQ1

RESTROOMS

# 2L FIXTS	KW	ENERGY USE (KWH) CURR.	PROP'D	ANNUAL SAVINGS (KWH)	($)	SIMPLE PAYBACK (YRS)
1	0.058	507	50	457	$21.93	5.8
2	0.116	1,013	100	914	$43.86	2.9
3	0.174	1,520	149	1,371	$65.80	1.9
4	0.232	2,027	199	1,828	$87.73	1.5
5	0.290	2,533	249	2,285	$109.66	1.2
6	0.348	3,040	299	2,742	$131.59	1.0

Assumptions:

Cost=	$128	(Watervliet Arsenal Report)
Operating hrs=	168	hrs/wk
Proposed op hrs =	16.5	hrs/wk
Percent savings =	90%	

BREAKROOMS

# 2L FIXTS	KW	ENERGY USE (KWH) CURR.	PROP'D	ANNUAL SAVINGS (KWH)	($)	SIMPLE PAYBACK (YRS)
1	0.058	106	15	90	$4.34	29.5
2	0.116	211	30	181	$8.69	14.7
3	0.174	317	45	271	$13.03	9.8
4	0.232	422	60	362	$17.37	7.4
5	0.290	528	75	452	$21.72	5.9
6	0.348	633	90	543	$26.06	4.9

Assumptions:

Cost=	$128	(Watervliet Arsenal Report)
Operating hrs=	35	hrs/wk
Proposed op hrs =	5.0	hrs/wk
Percent savings =	86%	

OFFICES

# 2L FIXTS	KW	ENERGY USE (KWH) CURR.	PROP'D	ANNUAL SAVINGS (KWH)	($)	SIMPLE PAYBACK (YRS)
1	0.058	151	124	27	$1.30	43.7
2	0.116	302	247	54	$2.61	21.9
3	0.174	452	371	81	$3.91	14.6
4	0.232	603	495	109	$5.21	10.9
5	0.290	754	618	136	$6.51	8.7
6	0.348	905	742	163	$7.82	7.3

Assumptions:

Cost=	$57	(wall switch relacement only)
Operating hrs=	50	hrs/wk
Proposed op hrs =	41.0	hrs/wk
Percent savings =	18%	

PINEBLUFF ARSENAL
SCREENING CALCULATIONS
OCCUPANCY SENSORS

RESTROOMS

#		ENERGY USE (KWH)		ANNUAL SAVINGS		SIMPLE PAYBACK
2L FIXTS	KW	CURR.	PROP'D	(KWH)	($)	(YRS)
1	0.058	151	50	101	$4.85	26.4
2	0.116	302	100	202	$9.70	13.2
3	0.174	452	149	303	$14.55	8.8
4	0.232	603	199	404	$19.40	6.6
5	0.290	754	249	505	$24.25	5.3
6	0.348	905	299	606	$29.10	4.4

Assumptions:

Cost=	$128	(Watervliet Arsenal Report)
Operating hrs=	50	hrs/wk
Proposed op hrs =	16.5	hrs/wk
Percent savings =	67%	

BREAKROOMS

#		ENERGY USE (KWH)		ANNUAL SAVINGS		SIMPLE PAYBACK
2L FIXTS	KW	CURR.	PROP'D	(KWH)	($)	(YRS)
1	0.058	106	15	90	$4.34	29.5
2	0.116	211	30	181	$8.69	14.7
3	0.174	317	45	271	$13.03	9.8
4	0.232	422	60	362	$17.37	7.4
5	0.290	528	75	452	$21.72	5.9
6	0.348	633	90	543	$26.06	4.9

Assumptions:

Cost=	$128	(Watervliet Arsenal Report)
Operating hrs=	35	hrs/wk
Proposed op hrs =	5.0	hrs/wk
Percent savings =	86%	

OFFICES

#		ENERGY USE (KWH)		ANNUAL SAVINGS		SIMPLE PAYBACK
2L FIXTS	KW	CURR.	PROP'D	(KWH)	($)	(YRS)
1	0.058	151	124	27	$1.30	43.7
2	0.116	302	247	54	$2.61	21.9
3	0.174	452	371	81	$3.91	14.6
4	0.232	603	495	109	$5.21	10.9
5	0.290	754	618	136	$6.51	8.7
6	0.348	905	742	163	$7.82	7.3

Assumptions:

Cost=	$57	(wall switch relacement only)
Operating hrs=	50	hrs/wk
Proposed op hrs =	41.0	hrs/wk
Percent savings =	18%	

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OCCUPANCY SENSORS – DETAILED INVENTORY

BLDG #	ROOM TYPE	# FIXT	W FIXT	TOTAL KW	# CIRC'S
10020	BREAK ROOM	4	113		1
	VENDING	2	60		1
	BREAK ROOM (230)	10	60		3
10030	BREAK ROOM	2	59		1
	REST ROOM	3	34		1
	MEN'S ROOM	1	60		1
	LADIES' ROOM	1	60		1
10050	DINING ROOM	4	425		1
	KITCHEN	5	61		1
	LOUNGE	4	59		1
	EXERCISE RM	6	59		1
	LAUNDRY	2	59		1
	REST RM/SHOWER	2	83		2
	TV ROOM	4	59		1
	LADIES REST.	1	59		1
13010	RESTROOM	2	40/75		1
	TRAINING RM	4	59		1
13020	LADIES' RM	1	75		1
	MEN'S RM	2	75		1
	REST RM	1	75		1
13030	REST RM	1	59		1
	LAUNDRY	1	59		1
	DRESSING RM	1	59		1
	CLASSROOM	3	110		1
	KITCHEN	2	110		1
	RESTROOM	1	75		1
13040	BREAK RM (9)	2	59		1
	MEN'S RM	1	59		1
	LADIES' RM	1	59		1

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BLDG#	ROOM TYPE	# FIXT	W FIXT	TOTAL KW	# CIRC.'s
13060	REST RM	1	60		1
13080	WOMEN'S RM	3	48		1
	MEN'S RM	3	48		1
13100	REST RM	1	100		1
13110	REST RM	1	60		1
16210	KITCHEN	2	59		1
	REST. RM	1	83		1
	LAUNDRY	2/1	34/56		1
	REST RM	1/1	34/59		1
16220	KITCHEN	2	59		1
	REST. RM	1	83		1
	LAUNDRY	2/1	34/56		1
	REST. RM	1/1	34/59		1
31010	NONE	-	-		-
31080	REST RM	2	59		1
	BREAK RM	2	61		1
32030	NONE	-	-		-
32035	BREAK RM	6	59		2
	REST RM	2	59		1
32060	COMP. RM	6	105		CB's
	BOILER RM	3/1	91/100		-
32070	BREAK RM	2	105		1
	MEN'S RM	1	105		1
	LADIES' RM	1	105		1

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BLDG #	ROOM TYPE	# FIXT	W FIXT	TOTAL KW	# CIRC.'s
32090	REST RM	1	59		1
	REST RM	1	59		1
	BREAK RM	8	59		2
	MEN'S RM	2	59		1
32100	BREAK RM	3	59		1
	MEN'S RM	3	59		1
	LADIES' RM	3	59		1
32130	REST RM	2	85		1
32150	REST RM	1	59		1
	REST RM	1	59		1
	REST RM	1	59		1
	REST RM	1	59		1
33060	COMP RM	6	105		CB?
	BOILER RM	3/1	91/100		CB?
33530	NONE	-	-		-
34110	NONE	-	-		-
34120	BREAK RM	2	59		1
	REST RM	1/2	34/59		1
34140	WATER CHEM	1	105		1
	BOILER RM	8/4	59/85		?
	REST RM	2	59		1
	COMP RM 1	4	105		1
	COMP RM 2	4	105		1
34910	CHANGE RM 2	15	59		1
	CHANGE RM 1	7	59		1

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BLDG #	ROOM TYPE	# FIXT	W/ FIXT	TOTAL KW	# CIRC.'s
34910 (cont.)	WO BREAK RM	4	59		2
	WO COPY RM	2	59		1
	T&D Lunch Rm	12	59		2?
	BGU BREAK RM	2	59		1
	BGU KITCHEN	2	59		1
	UTIL. BREAK	4	59		1
	UTIL KITCHEN	1	59		1
	ELEC. SHP BREAK	6	60		1?
	WASH AREA	2	59		1
34970	WOM.' LOUNGE	1	59		1
	MEN.'S REST.	1	34		1
	KITCHEN	1	59		1
44100	COFFEE RM	2	59		1
	NEW LOCKER RM	13	59		1
	SHOWER AREA	6	59		2
	OLD LOCKER RM	36	59		4?
	LOCKER REST RM	8	59		2
	WOMEN'S LOCKER	6	59		1
	WOM.'S SHWR #1	5	59		1
	WOM.'S SHWR #2	2/3	34/59		1
	WOM.'S BATH RM L.	4	59		1
	LOUNGE REST.	3	59		1
51420	BREAK RM (34)	3	59		1
	MEN'S CHANGE RM (32)	4	59		1
	WOM.'S CHANGE RM (30)	3	59		1
	MEN'S RM.	2	59		1
	WOM.'S RM	3	59		1
	COPIER RM	2	59		1

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BLDG #	ROOM TYPE	# FIXT	W/ FIXT	TOTAL WATTS	# CIRC.'s
51430	RESTROOM	1	75		1
	OFFICE 3 Rest.	2	23		1
53160	BREAK RM	9	59		
	WOM.'s CHANGE	2/9	34/59		3
	MEN'S CHANGE	1/12	34/59		4
	COM. REST.	2	59		1
60020	BREAK RM	2	59		1
	MEN'S RM	1	59		1
	WOM.'S RM	1	59		1
	LOCKER RM 1	2	59		1
	LOCKER RM 2	5	59		1
60060	BREAK RM	6	59		1
	MEN'S RM	1/1	34/59		1
	WOM'S RM	3	59		1
60070	SHOWER AREA	2	59		1
	MEN'S LOCKER	2	59		1
	WOM.'S SHWR.	2	59		1
	MEN'S REST.	1	59		1
60090	KITCHEN	1	59		1
	WOM.'S RM	3	34		1
	MEN'S RM	2	34		1
60650	BREAK RM	2	59		1
	WOM.'S REST.	2	59		1
	MEN.S REST.	1/3	23/59		2

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BLDG #	ROOM TYPE	# FIXT	W/ FIXT	TOTAL WATTS	# CIRC.'s
63100	WOM.'S REST.	2	59		1 ?
	MEN'S REST.	1	59		1
	CHANGE RM	4	59		1
	BREAK RM	2	59		1
63110	SMOKE BRK.	2	59		1
	BREAK RM	2	59		1
63120	CHANGE AREA	2/4	23/59		1
	REST RM. 1	1	59		1
	BREAK RM	2	59		1
63200	BREAK RM	9	59		1
	MEN'S RM	2	59		1
	WOM.'S RM	2	59		1
63210	BREAK RM	10/1	59/100		1
63410	LOCKER RM 1	13	59		2 ?
	SHOWERS 1	10	59		2 ?
	LOCKER RM 2	8	59		2
	REST RM 1	2	59		1
	LOCKER RM 2	1/3	22/59		1
	SHOWERS 2	6	59		1
	REST RM 2	3	59		1
	KITCHEN	7	59		1
	BREAK RM	8	59		1
	MEN'S RM	1/3	59		1
	WOM.'S RM	3	59		1
	MEN'S CHANGE	13	59		1
	MEN'S SHWRS	1/9	22/59		1
	REST RM 5	3	59		1

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_____

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BLDG #	ROOM TYPE	# FIXT	W/ FIXT	TOTAL WATTS	# CIRC.'S
63410	WOM'S LOCKER	7	59		1
	WOM.'S SHWRS	6	59		1
	WOM.'S REST.	4	59		1
	ICE MACH RM	1/2	22/59		1

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Screening Calc's. - Occupancy Sensor with & w/o Compact Fluorescents

Restrooms

Assume lights are left on 168 hrs/wk

Estimate payback - assume 90% savings

Room size	=	—
Lighting load	=	75 watt incand.
Annual hrs.	=	8760 hrs
Annual Use (before)	=	657 kwh
" (after)	=	66 kwh
" (savings)	=	591 kwh

Simple payback = $\frac{\$128}{591 * 0.048}$ = 4.5 yrs

With compacts = $\frac{128}{591 * 0.048 \left(\frac{19.1}{75}\right)}$ = 17.7 yrs

Savings - Assume 2/3 savings

Energy rate - 6.6¢/kwh avg. (incl demand)
3.0¢/kwh energy only
use 4.8¢/kwh since this ECO may or may not reduce demand

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Screening Calc's - Compact Fluorescents

Assume lights operate 50 hrs/wk

Estimate payback

Annual energy use (Fixt and.) = $\frac{75 \text{ watt} * 50 * 52}{1000}$ = 195 kwh

or 0.67 MBTU

Proposed energy use (Compact) = $\frac{19.1 * 50 * 52}{1000}$ = 50 kwh

or 0.17 MBTU

Savings = 195 - 50 = 145 kwh or 0.49 MBTU

Cost Savings = 145 * 0.066 = # 9.6/yr.

Simple payback = $\frac{\$24}{\$9.6}$ = 2.5 yr. payback

Lebor - Grainger 1994, p. 776 Phillips SLS20

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Construction Cost Estimate

SHEET OF

AE FILE NO.

PROJECT: Lighting Energy Study

DATE: 3/20/95

Location: Pine Bluff Arsenal

ESTIMATOR: Hutchins

BASIS FOR ESTIMATE: ☒ PRE-DESIGN STUDY ☐ SCHEMATIC DESIGN ☐ DESIGN DEVELOPMENT ☐ FINAL DESIGN

CHECKER

SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR PER UNIT	LABOR TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
Ceiling Mtd. Ultra-Sonic							
Occupancy Sensor	122	ea	31.35	3825	56.11	6845	
Power pack	122	ea	-	-	17.54	2140	
Mounting brackets	122	ea	-	-	7.00	854	
Subtotals				3825		9839	
Means City Labor Cost Index			x0.70	2678		9839	12,517
ANNUAL REPL COSTS							
5-YR LIFETIME - ASSUME							
REPLACE 1/5 = 24/YR	24	EA					2,462

Source: Materials - U.S. Govt.
Labor - Means 1.14 hrs/sensor @ $27.50/hr.

ECO Number 8

LED EXIT SIGN LAMPS

Discussion

The majority of exit signs in the 45 surveyed buildings contain two, 15-watt incandescent lamps. LED lamps are a low-cost, energy-efficient retrofit. It was noted that many exit signs are burned out, and many exits do not have signs.

A survey of the drawings show that there are a total of approximately 225 exits in the 45 buildings. Ten of the exits have radioactive signs, and 55 have existing signs. This project is for retrofits of the 55 signs, only.

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DESIGNER Hutchins DATE 3/6/95

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ECM Exit Sign Lamp Replacement

Final Energy Savings Calc.

Present energy use -
(assume 2-15 watt incandescents per sign)

$$55 \text{ signs} * 2 * \frac{15 \text{ watt} * 8760 \text{ hr/yr}}{1000} = 14,454 \text{ kwh or } 49.3 \text{ MBTU}$$

Proposed system energy use
(1.8 watts/sign LEDs)

$$55 * \frac{1.8 \text{ w} * 8760}{1000} = 867 \text{ kwh or } 3.0 \text{ MBTU}$$

Savings: $14,454 - 867 = 13,587$ kwh

or

$49.3 - 3.0 = 46.3$ MBTU

Cost Savings = $13,587 * 0.066 \approx \$900/\text{yr.}$

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SUBJECT _____ AEP NO _____
SHEET _____ OF _____
DESIGNER Hutchins DATE 3/3/95
CHECKER _____ DATE _____

Exit Sign Inventory

Bldg #	Description	REQD #	REPD #:	Comments
10-020	Admin -	12	12	
10-030	Admin. (Gen Purp.)	4	-	radioactive type
10-050	Fire HQ	8	2	few noted
13010	Com. Serv.	2	2	
13020	Health Clinic	3	3	
13030	52ND EOD	3	3	
13040	Counseling	3	3	
13060	Clinic	3	3	
13080	Laboratory	1	1	
13100	Infirmary	2	2	
13110	Audio-Vis. Fac	1	1	
16210	Barracks	2	2	
16220	Barracks	2	2	
31010	Electronic Cal.	1	1	
31080	"	2	2	
32030	Inspection Garage	3	-	none noted
32035	Ord. Shop (Motor Pool)	4	-	none noted
32060	Boiler House	2	-	none noted
32070	Impreg. & Laundry	4	-	none noted
32090	Warehouse	10	-	none noted
32100	Elec/Comm Lab	6	-	radio active type
32130	Ammo Qual Assess.	5	5	
32150	"	3	-	none noted
33060	Boiler House	2	-	none noted
33530	Fill & Press (Pack out only)	10	-	none noted

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SUBJECT _____ AEP NO _____

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DESIGNER _____ DATE _____

CHECKER _____ DATE _____

Exit Sign Inventory (cont'd)

Bldg #	Description	REQ'D #	REP'D #	Comments
34110	WP Filling	8	-	none noted
34120	Ammo Qual. (S.)	3	-	none noted
34140	Boiler House	4	-	none noted
34910	Admin	26	2	few noted
34970	Admin.	4	-	none noted
44100	Prod. Field Off.	4	4	
51420	Officer / DMMD	6	4	
51430	Engr. Admin.	4	-	None noted
53160	Chem. Admin	6	6	
60020	Security	4	3	
60060	Admin.	4	4	
60070	Fixed Lamed.	7	2	few noted
60090	TC Admin	4	4	
60630	Warehouse	4	-	none noted
63100	Chem. Field Maint.	5	-	none noted
63110	Chem. Maint.	5	2	few noted
63120	"	4	-	none noted
63200	"	4	3	
63210	Mask Repair	4	4	
63410	Toxic/Corr. Chng Hse	17	17	

TOTAL	225
Radioactive	10
Candidates	215
Retrofits	55
New Signs	160

TOTAL 55

RS&H

SUBJECT _____ AEP NO _____

_____ SHEET _____ OF _____

DESIGNER _____ DATE _____

CHECKER _____ DATE _____

EXIT SIGNS - Screening Calc.s

Estimate energy use:

- Typical exit sign has 2 - 15 watt incandescent lamps
- Energy use = $\frac{2 * 15 * 8760}{1000}$ = 263 kwh/yr.
- Energy cost = 263 kwh/yr * 0.0622 ¢/kwh (avg.)

  = $16.30/yr. per sign

Calc. simple payback on various types

L.E.D Retrofit kit - 25 yr warranty

- Cost = $38.00 + 3.33* = 41.33
- Energy use = $\frac{1.8 \text{ watts/face} @ 1 \text{ face} * 8760}{1000}$ = 15.7 kwh/yr.
- Energy cost = 15.7 * 0.0622 = ¢98/yr.
- Savings = 263 - 15.7 = 247 kwh/yr 16.3 - 0.98 = $15.30/yr
- Simple Payback = 41.33 / 15.3 = 2.7 yrs.

* 5 min installation at $40.00/hr.

RS&H

SUBJECT _____ AEP NO _____

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New L.E.D. sign

Indirect View: 1-sided - $65 + labor = 65 + 20 = $85

Simple payback = 85/15.3 = 5.6 yrs

Direct View: 1-sided - 80 + 20 = $100

Simple payback = 100/15.3 = 6.5 yrs

Compact Fluorescents

Two 5 watt lamps and ballast

Cost = 18.50 + 20 = $38.50

Energy use = $\frac{5 * 2 * 1.1 * 8760}{1000}$ = 96.4 kwh/yr

Energy Savings = 263 - 96.4 = 167 kwh/yr

Cost Savings = 167 * 0.0622 = $10.40/yr

Simple payback = 38.50 / 10.40 = 3.7 yr.

RS&H

SUBJECT _____ AEP NO _____

_____ SHEET _____ OF _____

DESIGNER _____ DATE _____

CHECKER _____ DATE _____

Exit Sign Retrofit Options Summary

Type	Payback (yrs) Retros	Payback (yrs) Total	Project Cost [1]
L.E.D Retrofit	2.7	3.9	$13,000
Compact Fluor.	3.7	-	-
New LED Sign (Ind.)	5.6	5.6	$18,700
New LED Sign (Dir.)	6.5	6.5	$22,000

(1) Without Markups

RS&H

Construction Cost Estimate

SHEET OF

AE FILE NO.

PROJECT: EXIT SIGNS

DATE: 3/3/95

Location: PINEBLUFF ARSENAL

ESTIMATOR: Hutchins

BASIS FOR ESTIMATE: [X] PRE-DESIGN STUDY [ ] SCHEMATIC DESIGN [ ] DESIGN DEVELOPMENT [ ] FINAL DESIGN

CHECKER

SUMMARY	QUANTITY NO. UNITS	QUANTITY UNIT MEAS.	LABOR PER UNIT	LABOR TOTAL	MATERIAL PER UNIT	MATERIAL TOTAL	TOTAL COST
LED Retrofit	55	ea	2.70	148.50	38-	2090	
Subtotal				1149		2090	
Means Labor Index				*0.67			
Subtotal				100		2090	2190

Source: National Lighting '94 Means

(materials)

(labor) 1/10 hr @ 27.50/hr

4.2 Multiple ECO Project Evaluations

ECIP Number 1

LIGHTING RETROFITS

Discussion

This project combines several ECOs as listed below:

ECO #	ECO Description
1	Upgrade or Replace Lighting
4	Occupancy Sensors
8	LED Exit Sign Retrofits

Detailed discussions are contained in the previous section (4.1).

Recommendations

The life-cycle cost analysis program LCCID 1.092, was used to determine the cost/benefits of this ECIP. Based on the energy savings to Pine Bluff Arsenal, it is recommended. The results are summarized below.

Construction Cost	$370,226
Annual Energy Savings (MBtu/year)	
Electricity	3,135
Annual Energy Cost Savings ($/year)	$63,108
SIR	2.0
Simple Payback (years)	5.9

LIFE CYCLE COST ANALYSIS SUMMARY STUDY: PBA01
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP) LCCID FY95 (92)
INSTALLATION & LOCATION: PINE BLUFF ARSREGION NOS. 6 CENSUS: 3
PROJECT NO. & TITLE: 1 LIGHTING STUDY
FISCAL YEAR 95 DISCRETE PORTION NAME: TOTAL
ANALYSIS DATE: 03-27-95 ECONOMIC LIFE 15 YEARS PREPARED BY: C. WARREN

1. INVESTMENT

A. CONSTRUCTION COST	$ 330558.		
B. SIOH	$ 19834.		
C. DESIGN COST	$ 19834.		
D. TOTAL COST (1A+1B+1C)	$ 370226.		
E. SALVAGE VALUE OF EXISTING EQUIPMENT		$ 0.	
F. PUBLIC UTILITY COMPANY REBATE		$ 0.	
G. TOTAL INVESTMENT (1D - 1E - 1F)			$ 370226.

2. ENERGY SAVINGS (+) / COST (-)
DATE OF NISTIR 85-3273-X USED FOR DISCOUNT FACTORS OCT 1994

FUEL	UNIT COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	$ 20.13	3135.	$ 63108.	12.02	$ 758553.
B. DIST	$ .00	0.	$ 0.	14.23	$ 0.
C. RESID	$ .00	0.	$ 0.	15.87	$ 0.
D. NAT G	$ .00	0.	$ 0.	14.17	$ 0.
E. COAL	$ .00	0.	$ 0.	13.28	$ 0.
F. PPG	$ .00	0.	$ 0.	13.49	$ 0.
M. DEMAND SAVINGS			$ 0.	11.94	$ 0.
N. TOTAL		3135.	$ 63108.		$ 758553.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)			$ -233.
(1) DISCOUNT FACTOR (TABLE A)		11.94	
(2) DISCOUNTED SAVING/COST (3A X 3A1)			$ -2782.

B. NON RECURRING SAVINGS(+) / COSTS(-)

ITEM	SAVINGS(+) COST(-) (1)	YR OC (2)	DISCNT FACTR (3)	DISCOUNTED SAVINGS(+)/ COST(-)(4)
d. TOTAL	$ 0.			0.

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-)(3A2+3Bd4) $ -2782.

4. FIRST YEAR DOLLAR SAVINGS 2N3+3A+(3Bd1/(YRS ECONOMIC LIFE)) $ 62875.

5. SIMPLE PAYBACK PERIOD (1G/4) 5.89 YEARS

6. TOTAL NET DISCOUNTED SAVINGS (2N5+3C) $ 755771.

7. SAVINGS TO INVESTMENT RATIO (SIR)=(6 / 1G)= 2.04
(IF < 1 PROJECT DOES NOT QUALIFY)